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STATISTICS
OF
TELEGRAPHY
BY
SIR JAMES ANDERSON

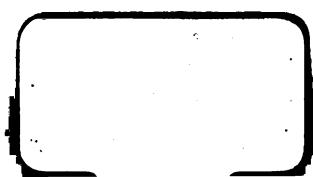
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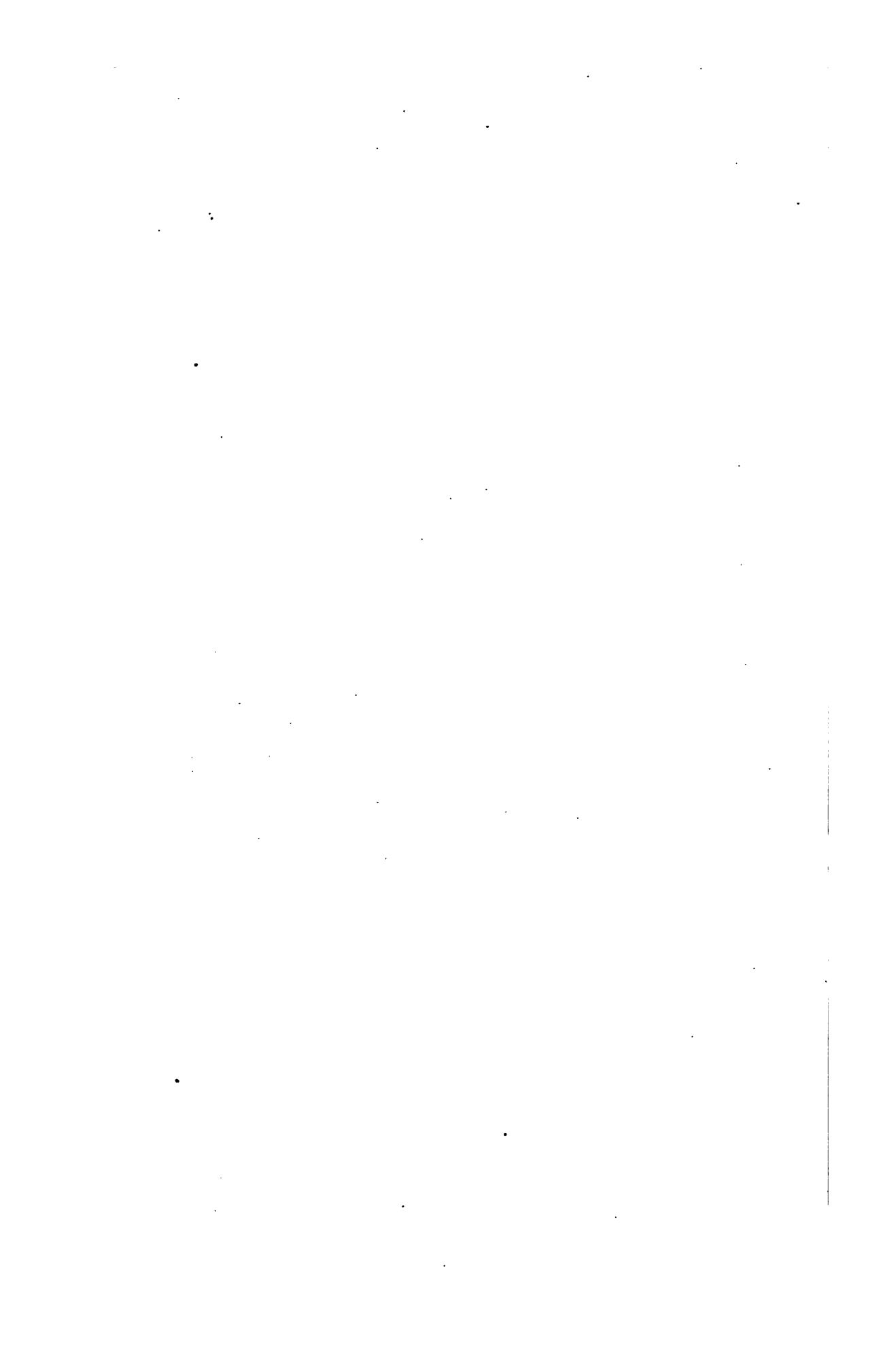
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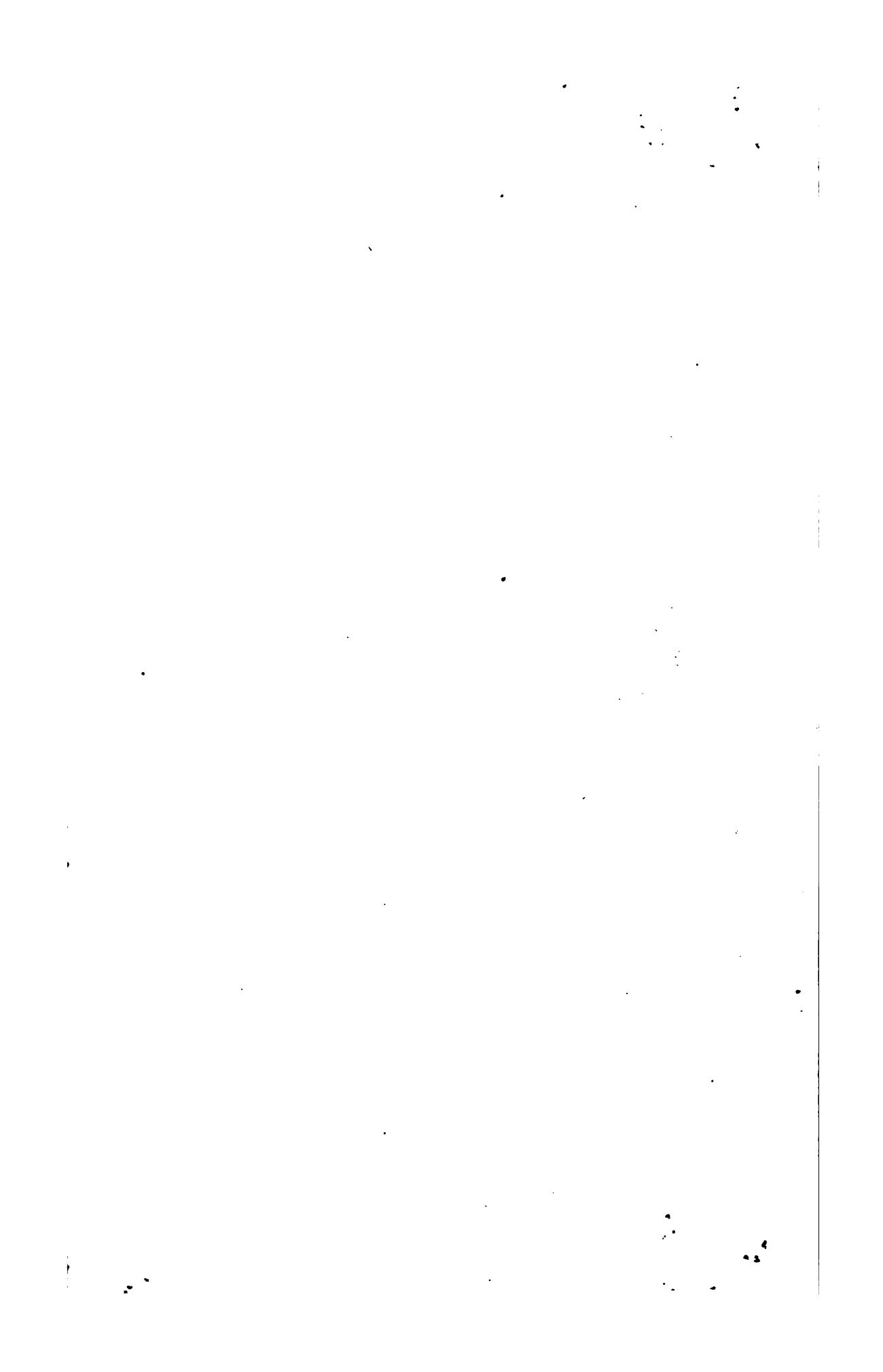
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STATISTICS
OF
TELEGRAPHY



BY

SIR JAMES ANDERSON.

READ BEFORE THE STATISTICAL SOCIETY,
JUNE 18TH, 1872.

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PREFACE.

► I DID not anticipate that this paper would assume dimensions requiring a preface as an apology for its length, but a glance at the Index will show that there is a great variety of considerations forced upon the attention of any one who may attempt to deal with this subject.

Although the Telegraph has been twenty years in general use, it is still a comparatively new power, startling in its effects even yet, and so much a part of the Imperial, commercial, and social system of every civilised nation, that it must be maintained and extended ; cost what it may, it can never be abandoned.

It can hardly fail to be of great interest to many to learn that there are established principles which regulate everything connected with it ; fixed points of departure which govern the science of electricity, and the form of cable, as well as tariff. I have dealt only with the principles affecting tariff, and the type of cable best suited for submarine telegraphs. No one will dispute my claim to have had opportunities of forming some decided opinion upon both of these points. I have endeavoured to understand them without any bias one way or another, and having accepted the task of

placing on record the statistics upon this subject, I am obliged to acknowledge that the desire to be brief, and yet deal fairly with those practical points which are conclusively established, the want of leisure to enter deeper into the anomalies which I am sure investigation would remove, and the fact that sufficient reliable data of private Companies and many States do not yet exist, by which one can do more than confirm general principles, all combine to make this paper but a first contribution to a comprehensive treatment of Telegraph Statistics; five years hence it can be resumed with decided practical advantage, and whoever attempts it may learn from this first instalment what may with profit be discarded, elaborated, or added.

To the thousands who are interested in the reduction of tariff, and in this class of enterprise as an investment, these pages, with all their faults of style and method of treatment, are respectfully dedicated by

Their faithful servant,

JAMES ANDERSON.

London, *July*, 1872.

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PART I.

EFFECTS OF TARIFF, AND PRINCIPLES WHICH GOVERN TRAFFIC, &c., &c.

This paper was commenced with the object of reading before the Statistical Society the practical results which might seem to be established by the experience of twenty years.

Like every one else, I entertained the belief at one time that a reduced tariff was the key to success in private telegraph enterprise. That this success was not realized in practice was disappointing in the extreme, and created the apprehension that there might be some conditions, which, if properly understood, could be removed, and a large increase of correspondence realized.

I did not know that investigation would establish so great a difference between international and internal telegraphy; the main element of the former being simply commercial, while the latter has the two great currents of social and commercial life to draw from.

The consideration of all the statistics which I could collect soon convinced me that, for the present, there were only two practical points to be developed with any satisfactory result, and I have tried to establish, so far as available statistics will confirm, *first*, the effect of reduced tariffs upon telegraphy, both within the limits and outside the limits of a country, and *second*, to give a statement of all the Submarine cables hitherto laid, and to express what, in my opinion, is established by all the experience we have obtained up to the present time.

There is no lack of telegraphic statistics, but they have not all been collected upon any uniform system, one class of telegrams has not been separated from another, and in every country, and

with every private Company, there has been a varying tariff at irregular intervals, under different political and commercial conditions, which makes the greater part of the statistics of little or no value for the purposes of comparison.

There are, however, sufficient reliable data to establish certain axioms and principles indicating very clearly the results to be anticipated in the future from tariffs or management under either Government or private control.

Belgium and Switzerland for 20 years have enjoyed a telegraphic system under the control of Government, and have been more than any other countries undisturbed by wars, political convulsions or change of superficial area, and, as might have been expected, the most reliable statistics are given by these countries. Add to this the fact that the chiefs of these administrations are men of unusual ability, who have given their undivided attention to the development and improvement of the system under their management and to the logical statement of the cause and effect produced by any change whatever upon any branch of telegraphy.

We are indebted to Switzerland for the organisation of telegraphic statistics upon a uniform plan, and for originating the International Telegraphic conventions, which have already been held at Paris, Vienna and Rome.

I have been so much gratified by the report presented by the Belgian Minister of Public Works, M. Jamar, upon the result of the reductions of tariff from the year 1855 to 1869, that I have translated and produced it in an abridged form and embodied it in this paper, believing that it should be read by every one who cares to understand the subject.

I have read with care the able reports of Mr. Scudamore, the Chief of the Telegraph Administration of the United Kingdom, and I have made free with whatever extracts seemed to bear upon the point I wished to illustrate.

So much has, in fact, been already written by these authorities, that I shall probably find it difficult to touch upon many points not covered by them; but, in the case of Belgium, the report is published in French, and not likely to be so extensively known

as it ought to be in this country, without being produced in the abridged form, and practically applied to our own system in some such manner as I have attempted.

The reports of Mr. Scudamore have for their object the illustration of the probable effect which would result from the working of the Inland Telegraphs by the Post Office, together with a statement of the effect actually produced.

Although I find something about everything connected with telegraphs in reports already published, they are mainly restricted to the operation of internal telegrams, and I cannot well do wrong in freely using the information contained in them which seems to establish any fixed points whatever, either in relation to Internal Telegraphy or in relation to International Telegraphs, the branch in which I am specially interested.

These two branches of telegraphy will be found differing from each other both in development and expense; the principles which affect these results are fully established, and provide ample reasons for maintaining a comparatively higher tariff for the latter than for the former, whether the telegraph is under private or Government control.

The statistics of private companies are not given with all the detail at my command, but the most accurate details will not alter the general deductions. It will always be found that were it possible to maintain a high tariff upon international telegrams the normal increase of telegraphic correspondence would inevitably yield a larger revenue than can possibly be obtained by any reduction of tariff. So that, however much every one engaged in the control of telegraphic enterprise may desire to reduce the tariff and increase the correspondence, they should not forget that this increase, although certain, will decrease the revenue; other considerations must therefore influence their judgment before they sacrifice the immediate interests of their shareholders. In illustration of this, I give the following statement which compares the actual result of working a private telegraph company under a gradually reducing tariff with that which would have obtained had the high tariff been maintained.

The first table is from Mr. Scudamore's report—

TABLE I.

A Statement showing the Total Number of Messages transmitted, the Revenue earned, the Working Expenses incurred, and the Net Produce earned by the Electric and International Telegraph Company in the years 1862 and 1866, together with the Proportion of Working Expenses to Revenue, the number of Messages to each mile of wire, the Revenue and cost per mile of wire, and the Revenue and Cost per Message in each of the two years:—

		1862.	1866.
Total Number of Messages transmitted ..	..	1,534,590	3,150,149
Being an increase at the rate of .. ..	..		105%
Revenue .. .. .. ..	..	£219,441	£336,458
Being an increase at the rate of .. ..	..		53%
Working Expenses .. .. .. ..	..	£148,609	£208,739
Being an increase at the rate of .. ..	..		40%
Net Produce .. .. .. ..	..	£70,832	£127,719
Being an increase at the rate of .. ..	..		80%
Proportion of Working Expenses to Gross Revenue .. .. .. ..	..	67%	62%
Proportion of Gross Revenue to Capital employed .. .. .. ..	..	24%	32%
Proportion of Net Revenue to Capital employed .. .. .. ..	..	74%	12%
Number of Messages per mile of wire ..	..	44	66
Gross receipt per mile of wire .. .. ..	..	£6 5 1	£7 1 5
Working cost per mile of wire .. .. ..	..	4 4 9	4 7 9
Net receipt per mile of wire .. .. ..	..	£2 0 4	£2 13 8
Gross receipt per message .. .. ..	..	£0 2 10 $\frac{1}{2}$	£0 2 1 $\frac{1}{2}$
Working cost per message .. .. ..	..	0 1 11	0 1 3 $\frac{1}{2}$
Net receipt per message .. .. ..	..	£0 0 11 $\frac{1}{2}$	£0 0 9 $\frac{1}{2}$

This Table illustrates the effect of lowering the tariff upon the receipts and expenditure of a private company. The tariff was lowered several times upon different sections during this period, but it is not pretended that this was the sole cause of the increase of traffic, a part must be attributable to extensions of accommodation, and a part due to the growth of population and trade. But these facts remain, as the result of lowering the tariff.

A. That while their business has increased at the rate of 105%, their working expenses have increased at the rate of 40% only.

B. That though the work done by each mile of wire was greater by 50% in 1866 than in 1862, the cost per mile of wire was higher in 1866 by only 3½%.

C. That though in 1866 their net produce per message was less by 1½d. than it was in 1862, their total net produce was greater by 80% in 1866 than in 1862.

Upon the hypothesis of the high tariff of 1862 being maintained we can give the following estimate:

The number of messages is arrived at by taking the mean increase in the number of messages from 1859 to 1862, the year when the tariff was reduced. (Table XXIV.)

The gross revenue is the amount of 2,726,264 messages, at 2s. 10½d., which is the gross receipt per message in 1862.

The working expenses are the actual figures for the year 1866, and it is certain they would have been considerably less had all the conditions remained the same as in 1862, with no further extensions, and only the normal development of traffic at the high tariff to provide for.

TABLE II.

THE ELECTRIC AND INTERNATIONAL TELEGRAPH COMPANY.
 Comparison of Actual Profits for the year 1866 with the
 Estimated Profits had the Tariff of 1862 continued in force to
 that date :—

		Actual.	Estimate.
Total Number of Messages	3,150,149	2,726,264	
Gross Revenue	£336,458	£389,843	
Working Expenses	208,739	208,739	
Net Profit	£127,719	£181,104	
Proportion of Working Expenses to Gross Revenue	62%	53%	
Proportion of Gross Revenue to Capital employed	32%	37%	
Proportion of Net Revenue to Capital employed	12%	17%	
Gross Receipt per Message	s. d. 2 1 $\frac{1}{2}$	s. d. 2 10 $\frac{1}{2}$	
Working Cost per Message	1 3 $\frac{1}{4}$	1 6 $\frac{1}{4}$	
Net Receipt per Message	0 9 $\frac{1}{2}$	1 4	

We see, then, that had the high tariff been maintained the Company would have earned an addition at least of £53,000, or a dividend of 17% net instead of 12% upon the capital employed.

It cannot be disputed that the public is better served by a low tariff and increased facilities, and that within certain limits this policy may be remunerative even to a private company. But it will be found throughout these pages to be equally indisputable that the highest return upon the capital invested will be obtained from a high tariff, and that the policy of a private company must always be to guard against unproductive extensions or facilities

to the public, lest the capital be seriously increased and the company finds itself attacked, when thus burdened, upon the productive sections only, by a new company with small capital, and the benefit of experience gained at the cost of others.

We find the companies in correspondence with the post office suggesting monopoly as a condition of further extensions and reduction of tariff. But Mr. Scudamore justly characterised this as "*creating a monopoly to earn dividends, instead of creating a monopoly to establish a self-supporting system for the benefit of the public.*" And in support of this latter object the report of July, 1866, compares the progress made by the private companies in England with that made by the telegraphs under the control of the Belgian Government, in substance as follows:—

The companies had increased their wires to the extent of 39% only.

Belgium had increased theirs to the extent of 107%.

The companies had increased their stations 33%.

The Belgium Government had increased their stations 81%.

By the combined operation of a reduced tariff and increased accommodation, Belgium had increased their inland messages at the rate of 557%, although *the increase upon all kinds of Messages was only at the rate of 286%.*

In the same period the messages of all kinds transmitted by the Telegraph Companies of the United Kingdom have increased at the rate of 123% only.

Belgium transacted in 1866, on a system twice as great as it was in 1862, a business four times that of 1862, and *their working expenses were only twice as great for this quadrupled increase.*

The amount of their business on each mile of wire was greater by 86% in 1866 than in 1862, yet the cost to them of each mile of wire was somewhat lower in 1866 than in 1862. Their net revenue was lower than in 1862, because they had aimed only at *creating a self-supporting service*, and yet in 1866 they had a net revenue equal to 12½% of their gross revenue.

Further, the Report states, that under the *régime* of the Companies, the towns in the United Kingdom having a population exceeding 2,000 were served as follows:—

30 % well served,
 40 % indifferently served,
 12 % badly served,
 18 % not served at all,

these latter having an aggregate population exceeding half-a-million inhabitants.

By this process of reasoning, Mr. Scudamore established the conviction that the Post Office could so work the Telegraph Service of the United Kingdom as to produce a considerable profit, and yield immense advantages to the public, and he supported his arguments and the fitness of his department for this duty, by the results which it had effected in the Money Order system and the management of the Post Office Savings' Bank, together with the enormous increase of postal communication.

Briefly stated, the annual distribution of letters had received an augmentation of 127 millions.

The distribution by the Book Post had proportionately increased.

The Pattern Post had been established, and made rapid progress.

The Registered Letters had increased 50 %.

The Money Order system had extended to the Colonies, and the gross amount of Money Orders within the United Kingdom had risen from £13,800,000 to £18,100,000 per annum.

And he showed that the Post Office could bring to the performance of this new Telegraph business 12,000 offices distributed equally, with regard to population, all over the kingdom.

“Thus bringing the Telegraphs closer to the population.

“Extending the hours during which they could be used daily.

“Reducing the charges for the transmission of Telegrams.

“And giving the facilities for the transmission of Money Orders by Telegraph.”

The result will demonstrate that, in all these anticipations, Mr. Scudamore had reasoned justly, and he gave the following reasons to illustrate the impossibility of private companies carrying out the desired improvement.

The unavoidable accompaniments to private and joint-stock

enterprise produce a series of obstacles to cheapness and progress that only Government control can overcome.

Rival Companies did not supply additional facilities to the general public, but only increased the number of competing lines and offices in the same centres of populous towns, which could have been as efficiently served by one Company.

The fact that two out of four of the Companies must either have been run off the field or forced to amalgamate with the other two, did not improve the condition.

The Capital was sunk, and the effect of amalgamation would be to induce the Directors to preserve the high tariff, and restrict all further extensions, so as to preserve good dividends with a large reserve.

There were 2,000 miles of wire and 350 offices in excess of the number of either required to do the same work. There were four boards of directors and four sets of leading officials, such as managers, secretaries, engineers and clerks, striving to make the largest possible return upon the least possible capital, and carrying on a wasteful competition without any benefit to the public.

It was obvious to Mr. Scudamore that this divided management and rivalry was sufficient to account for the feeble growth of telegraphs within the United Kingdom, and that so long as private companies considered it a condition of their existence to do their utmost to procure dividends and to avoid every extension which might prove unproductive, or try experiments with tariffs which might prove disastrous, there could be no hope of the grand development in telegraphy which had become a feature in several of the Continental nations.

When it was first proposed that the Government should purchase the Inland Telegraph, Mr. Scudamore anticipated that the total cost would be for the whole scheme fully mounted ... £2,500,000

But submarine cables and many important extensions, not previously contemplated, besides the higher value awarded to the Companies by the arbitrators for the sale of their plant, swelled the capital to the large sum of ... £7,500,000

The revenue anticipated, was per annum, £673,838, which for 14 months, the period the last published report gives for comparison; equals £786,000

The actual gross revenue for the 14 months ending March 31st, 1871 or more than ten per cent. upon the capital. £798,580

The working expenses were anticipated to be £360,000 per annum, which for fourteen months gives £420,000

The actual working expenses were certain not to exceed for the 14 months £470,000
About 58 % of the Revenue.

The balance of net profit is, therefore, more than sufficient to cover the charge for interest on capital.

The result showing 3 $\frac{3}{4}$ % per annum on the money invested.

The reduction of the tariff has given to the public, upon the number of messages transmitted, a clear benefit of £300,000, and 4,211 Stations have been opened and gradually brought into use from the date of the transfer of the telegraphs to the Post-office to May 31st, 1871.

The number of offices belonging to private companies was about 1,500.

Mr. Scudamore predicted that even in the first year of the working of the telegraphs *with undivided management*, they would very nearly, if not actually, obtain the estimated gross annual revenue.

That this gross annual revenue must inevitably grow from year to year.

That the estimated nominal proportion of expenditure to revenue, about 58 %, would not be exceeded, and throughout his estimates and report he recognises the full value of the following principles:

That nothing is more certain than the augmentation of business from the increase of facilities, the increase of speed, the accuracy of messages and the certainty in the public mind that the transmission and reply can be relied upon within a given time.

The following statement, showing an average increase of 7,185 messages per day for the last year, proves the accuracy of the anticipated augmentation :—

TABLE III.

Statement showing Total Number of Messages from February 5th, 1870, to February 4th, 1871, compared with the following year :—

<i>1870 to 1871.</i> Total Number of Messages Forwarded.	<i>1871 to 1872.</i> Total Number of Messages Forwarded.	Increase.	Average daily Increase.
9,486,240	12,108,855	2,622,615	7,185

We can rely, therefore, upon seeing in Mr. Scudamore's next report, besides an illustration of his great ability at organisation, the telegraphic correspondence augmented to a point which will appear fabulous, and be likely to convince those who have not contemplated the growth of this class of correspondence, that we are far from seeing the limit or grasping the full effect of this method of transmitting thought. In these official reports there has been no attempt to divide the inland, international and transit telegrams from each other, nor was this sub-division needed for their purpose; but we shall see presently that there is an important difference between them.

I will now show what Belgium has established by twenty years' experience under Government control, and a study of telegraphic statistics more systematic and complete than has been possible with any other country.

I have translated and abridged that part of the report which may properly be termed "A STUDY OF THE THEORETICAL AND PRACTICAL EFFECT OF TARIFFS UPON ALL BRANCHES OF TELEGRAPHIC CORRESPONDENCE."

The report is signed by A. Jamar, Minister of Public Works, and will be found in its extended form, with appendixes demonstrating the principles of the tables in Vol. XXVIII. of the Annals of the Public Works of Belgium.

It begins with the statement that the tax of $\frac{1}{2}$ a franc for Telegrams within the State is a point beyond which no one would dream of further reduction.

But it is only one-half of the tariff charged for international messages, and the same difference exists in the *régime* of neighbouring countries.

At first sight this apparent anomaly suggests the logical propriety of international tariffs being composed of the sum of the internal tariffs.

A statement of the motives for maintaining a higher tariff for international telegrams demonstrates the following principles:—

1st. That in Belgium, notwithstanding the existence of the most favourable circumstances, *all reduction of tariff has resulted in a diminution of the net product.*

2nd. That in the interior service the diminution of net product has been of small importance, and has been accompanied by an immense development of correspondence, that is to say, *of service rendered to the public.*

3rd. That in the international relations *the reduction of the tariff has resulted in a considerable loss, with a much less development of correspondence*, as compared with the internal service, that is to say, *less service rendered to the public.*

Thus the Government is justified before all in reducing the tariff upon inland telegrams, and in deferring the reduction of the international tariff until the increase of traffic overtakes the deficit in revenue caused by the reduction.

These deductions have never been refuted, and carry with them mathematical proofs in support of the resolution formulated in the following terms at the Telegraphic Conference held at Vienna, July 7th, 1868.

“Il n'existe aucune corrélation entre les taxes intérieures et les taxes internationales.”

TABLE IV.

Gives the total product and expenses of the telegraphic service since its origin, until the 31st December, 1869.

In this condensed report the centimes are omitted.

Dates.	Gross Receipts.	Annual Expenses. Staff & Maintenance	Net Products.
1850 to 1851	Fr. 88,675	Fr. 59,116	Fr. 29,559
1852	165,974	56,163	109,811
1853	265,536	69,706	195,830
1854	280,846	89,796	191,049
1855	265,940	111,500	154,440
1856	359,580	132,289	227,291
1857	407,012	177,673	229,339
1858	413,926	219,391	194,535
1859	506,006	265,294	240,713
1860	527,744	332,501	195,243
1861	588,533	363,261	225,271
1862	605,045	405,300	199,745
1863	612,363	469,427	142,937
1864	789,399	553,118	236,281
1865	865,640	660,700	204,940
1866	962,213	836,959	125,254
1867	1,071,468	977,680	93,788
1868	1,197,102	1,185,483	11,619
1869 (1.)	1,322,771	1,298,915	23,856
Totals	11,295,773	8,264,272	3,031,501
Total of expenses for Construction, Acquisition, and Extension of the system			2,449,657
Surplus of Receipts over expenses of all kinds for the whole period of 20 years			581,844

(¹) The Receipts and Expenses for 1869 are not exactly known. The figures for this year are given approximately.

This table shows that the receipts have always sufficed to cover the expenditure, both of *personnel* and maintenance, and even to provide the capital required for the construction and extension of new lines, and their furnishing with all requisite appliances.

In supposing what is approximately exact, that the expense of establishing the lines at first has followed gradually upon the augmentation of the receipts, it can be admitted that the Govern-

ment has received interest for the money expended, and now finds itself in possession of the whole telegraphic system without any charge upon the public treasury, and with a surplus of 581,844 francs nearly.

The annual expenses consist of salaries of the *personnel*, maintenance of the lines, instruments, and accessories.

These can be considered as forming approximately the equivalent of the expenses of private companies.

The last column of Table IV. shows a rapid decrease of net product to a very low point in 1868, when it begins to recover.

The influence the modifications of tariff have had in producing this result requires to be carefully considered.

Telegraphic correspondence develops in virtue of the following causes:—

(a.) The augmentation of the number of offices, both for internal and foreign traffic, giving the utmost facility of access to the use of this means of correspondence.

(b.) The public become habituated to the use of the telegraph; and it passes gradually from the exclusive domain of important affairs to every day transactions, and to relations purely social and private.

(c.) Lastly. The lowering of the tariff, in placing the facilities of telegraphy within the reach of the greatest number, gives to the movement an impulse in proportion to the importance of each reform.

The two first causes act in a manner very regular; modified, however, by political and commercial circumstances, and these circumstances modify equally the first effects of the reform of tariff.

The annual expenses follow on their side an ascending progression, influenced by the following conditions:—

(d.) The increase in the number of offices; the accession of new localities relatively unproductive; the improvement of instruments; increase of salaries; and, in general, all measures inevitable or favourable to the public, which do not directly lead to any increase of traffic.

(e.) The regular development of the means of correspondence, instruments, new wires, clerks, messengers, &c., &c., consequent upon the gradual augmentation of the movement under the causes a. and b.

(f.) Lastly. The exceptional development of the means of

correspondence to meet the demand consequent upon a reduced tariff, the third cause, *c.*, referred to above.

In order to appreciate the result of these reforms it is necessary to eliminate in the series of annual movements the receipts and expenses which correspond to each year, resulting from the causes above named, *c.* and *f.*; or, in other words, *to calculate what would have been the result if the tariffs had remained unaltered.*

These can only be hypotheses, but the study of facts approach these hypotheses in reality as much as need be required.

In counting for each year the telegrams exchanged in Belgium, both local and foreign, it can be stated that their number follows without change of tariff a geometrical progression varying by reason of the circumstances already referred to. The mean of this progression is an annual increase of 12%, to 13% during a period of 15 years, upon the supposition that the tariff had remained the same and the circumstances had continued neither better nor worse.

A *normal* rate of *progression* is assumed equal to the mean for certain years, in which the progression was sometimes more and at other times less.

The first reduction of tariff dates from 1856. Until then the charges were high and regular, generally about 2fr. 50c. per zone, &c.

The development of traffic up to this time resulted for the most part from the establishment of telegraphic relationship with new countries, and the establishment of the principal offices in Belgium.

In order, then, to establish a regular law of development, and eliminate the influence of tariffs, it is necessary to take the year 1855 as the point of departure.

Modifications of tariff were frequent events after this period, but none of them affected all the branches of telegraphy at any one time. The normal rate of progression for each year can therefore be based upon the sum of the relations in which the tariff has not been changed.

In other words the effect of reduced tariffs and all exceptional development is eliminated from the years subsequent to 1855, and the assumption maintained that the tariffs and conditions remained unaltered; this gives variations in each year, but establishes an average rate of progression for the 14 years of 12½ per cent.

This is the only possible mode of valuation, and furnishes the following elements:—

TABLE V.
Correspondence of Belgian Telegraph Offices of all kinds.

Dates.	Number of Telegrams Exchanged.	Rate of Progression.		Number of Telegrams without reduction of Tariff.
		Real.	Normal.	
1851	12,706	..... 56½	..... 56½	12,706
1852	19,910	..... 75	..... 75	19,910
1853	34,815	..... 33	..... 33	34,815
1854	46,211	.....	.....	46,211
*1855	52,004	12½	12½	52,004
1856	78,237	50½	20	62,405
1857	89,801	15	0	62,405
1858	105,767	18	8	67,397
1859	149,245	41	31	88,290
		17½	13½	
1860	175,415	..... 21½	..... 15	100,209
1861	213,066	..... 10½	..... 9	115,240
1862	235,209	..... 49	..... 12	125,612
1863	351,003	..... 28	..... 17	140,685
1864	449,848	..... 30	..... 13	164,601
1865	584,854	..... 71	..... 14	185,999
1866	999,132	..... 16	..... 6	212,039
1867	1,156,570	..... 16½	..... 6½	224,761
1868	1,348,737	..... 14	..... 10½	239,370
1869	1,534,413	.....	.....	264,504
Totals...	7,636,943	.....	.....	2,219,163

Under the reduced tariffs 7,636,943 telegrams have been transmitted in 19 years.

Whereas only 2,219,163 could have been transmitted (which is *less than* one-third) if the tariff anterior to 1856 had been maintained. This is the most important result of the reform of tariff, even worthy of a great sacrifice.

The normal rate of progression being found, the same progression for the receipts can be admitted approximately, in the hypothesis of the same tariff being maintained.

It is not the same with the expenses. We have seen that there are inevitable causes which increase the expenses (par. *d*), and which are independent of the amount of correspondence.

On the other hand the influence of the movement *e* and *f* ought not to take effect in proportion to the number of telegrams; in proportion as this number augments, the expense occasioned by this augmentation ought to tend to diminish the cost of the unit of work.

This benefit, resulting from a great quantity of operations, is less in telegraphy than in any industry. Telegrams must be transmitted one by one, and receive minute care. There is, however, in a great quantity, a certain benefit which must be taken into account.

In observing the series of expenses which have actually been produced, we obtain a simple enough comparison between the rate of progression of expenses and that of the augmentation of correspondence.

This comparative resemblance permits us to calculate *what would have been the economy if the total traffic had not been more than tripled by the reduction of the tariff.*

The series of expenses thus corrected figure in Column 12 of the following Table VI.

TABLE

Table indicating the Net Annual Products of the Working of
of these Products upon the hypothesis of

Dates. 1	RECEIPTS AND EXPENSES of Telegraphs in the kingdom of Belgium from the first organiza- tion of the Service up to December 31st, 1869.					Annual Expenses. 6	Net Products. 7		
	Total Receipts paid in to the Public Treasury.								
	Interior Service. 2	Inter- national Service. 3	Transit Service. 4	Total. 5					
1850—51	Fr. 29,824	Fr. 43,462	Fr. 15,387	Fr. 88,674	Fr. 59,116	Fr. 29,558			
1852	31,747	64,749	69,476	165,973	56,162	109,810			
1853	46,800	96,795	122,441	265,536	69,706	195,830			
1854	53,025	128,353	99,468	280,845	89,796	191,049			
1855	52,311	147,210	66,517	265,939	111,500	154,439			
1856	71,286	179,663	108,630	359,579	132,288	227,291			
1857	81,647	176,515	148,849	407,011	177,672	229,338			
1858	89,814	187,162	137,449	413,926	219,391	194,535			
1859	126,297	220,032	159,676	506,006	265,298	240,712			
1860	142,844	232,877	152,521	527,743	332,500	195,242			
1861	171,225	257,748	159,558	588,532	363,261	225,271			
1862	176,643	280,449	147,952	605,044	405,300	199,744			
1863	211,063	277,266	124,033	612,363	469,426	142,936			
1864	282,591	307,956	198,850	789,399	553,118	236,281			
1865	345,289	340,103	180,247	865,640	660,700	204,940			
1866	407,532	369,900	184,780	962,213	836,958	125,254			
1867	469,749	409,290	192,427	1,071,468	977,680	93,787			
1868	549,263	424,138	223,700	1,197,102	1,185,483	11,619			
1869	598,739	450,576	273,454	1,322,771	1,298,915	23,856			
Totals	3,936,097	4,594,250	2,765,424	11,295,773	8,264,272	3,031,501			

VI.

Telegraphs in Belgium, from Official Summaries; and the Valuation maintaining the first tariffs without reduction.

RECEIPTS AND EXPENSES					
Calculated upon the hypothesis of the Maintenance of the Tariff prior to 1856.					
Rate of supposed normal Progression. P. c.	Receipts, supposed, from Interior and International Service.	Receipts from Transit Service without modifications.	Total.	Annual Expenses, supposed. Reduced Cost of Staff and Maintenance.	Net Products, supposed.
8	Fr.	Fr.	Fr.	Fr.	Fr.
	73,287	15,387	88,674	59,116	29,558
..	96,496	69,476	165,973	56,162	109,810
..	148,095	122,441	265,536	69,706	195,830
..	181,877	99,468	280,845	89,796	191,049
..	199,422	66,517	265,939	111,500	154,439
20	239,806	108,680	347,986	118,900	229,086
0	239,806	148,849	388,155	154,600	233,555
8	258,450	187,449	395,900	187,800	208,600
31	388,670	159,676	498,246	219,800	278,946
13½	384,277	152,521	536,799	275,900	260,899
15	441,919	159,558	601,478	298,400	308,078
9	481,692	147,952	629,644	327,100	302,544
12	539,495	124,088	663,528	341,000	322,528
17	631,209	198,850	830,060	395,200	434,860
18	718,366	180,247	898,514	455,700	437,814
14	813,123	184,780	997,904	497,400	500,504
6	861,911	192,427	1,054,339	584,800	469,539
6½	917,935	223,700	1,141,635	731,700	409,935
10½	1,014,318	273,454	1,287,778	785,700	502,078
	8,568,463	2,765,424	11,333,888	5,754,281	5,579,606

Columns 2 to 7 show the receipts, expenses, and net products of the 19 years such as they have been already given, but this Table separates the interior telegrams from the international and transit service.

Column 9 contains the receipts of the Interior and International service upon the hypothesis of the tariff anterior to 1856 being maintained.

Until 1855 inclusive, the figures in this column are equal to the sum of columns 2 and 3.

After 1856 each receipt is equal to that of the year preceding, with the addition of so much per cent. as is assumed to have been the rate of normal progression.

This rate is shown in column 8. Column 10 gives the receipts for Transit telegrams, without modification, and they are added to the figures of the preceding column in order to furnish the complete column of supposed receipts, No. 11.

The supposed expenses in column 12 being deducted, we obtain in column 13 the supposed net product.

These products, identical with the real results until 1855, exceed them in 1856, by an insignificant amount, but go on always increasing, not by the increase of the total receipts, which remain nearly the same, but by the less rapid progression of the expenses.

The total result since the origin gives us the following comparisons, the differences being spread over the 14 years since 1856.

The total receipts are raised to 11,295,773 francs. They would have been without reduction of tariff 11,333,888 francs. That is, nearly equal.

The total expense of 8,264,272 francs would have been reduced to 5,754,281 francs upon the same hypothesis; and the net product, which has been 3,031,501 francs, would have risen to 5,579,607 francs.

These reductions of tariff have diminished the net product by the amount of 2,548,106 francs, which gives for each of the 14 years a relative mean deficit of 182,000 francs = £7,280 per annum.

In calculating by a similar method what part of the expense of construction and extension of lines is attributable to the reduction of tariff, we consider this value to be 678,719 frcs. (Report annexed C), that is to say, the capital expended was reduced from

2,449,657 frcs. to 1,770,938 frcs. Spread over 14 years there was an average expenditure of 48,480 frcs. which carries the annual relative deficit to 230,480 frcs.

By this sacrifice there has been transmitted and received in Belgium during 14 years an increase of 5,417,780 telegrams, or an average of 387,000 more per annum than under the old *régime*, which would only have given an average of 146,680 per annum during the same period. And it may even be doubted if this latter increase would have continued under the high tariff which at the present day seems almost prohibitive.

INTERNATIONAL SERVICE CONSIDERED.

In order to complete the comparisons it is necessary to separate the interior from the international service, and take a new point of departure; the year 1860, which precedes the first uniform and reduced charge, gradually introduced by the tariff of 1.50 frcs. per zone.

In each of the branches of traffic the number of telegrams and the total receipts are given exactly, but the valuation of the net product can only be obtained by an approximate division of the expenses amongst the several branches of traffic, *internal*, *international*, and *transit*.

The same agents, and often the same lines and same apparatus are used for the transmission of all the branches of the service.

The interior service comprises alone *two-thirds of the whole correspondence*. *It is for this service that the greater part of the lines are organised.*

All internal telegrams consist of two series of operations, one of departure the other of arrival.

An international telegram has only one departure or one arrival.

A telegram in transit has only one reception and one re-expedition, without expense of clerk to receive or send by messenger to its destination.

Various methods have been tried to calculate the *units of work and of expense* corresponding to each kind of telegram; between the results obtained there have only been insignificant differences, and the mean is expressed in the most simple and practical manner by the following proportions:—

Interior telegram	..	5 units of expense.
International ditto	..	3 " "
Transit ditto	.. ..	2 " "

In applying these co-efficients (vide annex D, Belgian report) to the given statistics of the last ten years, we obtain for the price of the interior telegram frcs. 2.11, 1.92 and 1.97 respectively for the years 1860, 1861 and 1862. Then when the tariff for 20 words was reduced to frcs. 1.50, the expense was reduced to 1.50, 1.35 and 1.27 in 1863, 1864 and 1865. After the first reduction of tariff to one franc, the expense fell to 90 centimes in 1866, and to 86 centimes in 1869, after the final reduction of tariff to 50 centimes.

The interior traffic produced then a deficit under the new tariff as with the preceding tariffs. We will see further on, *that compensation is obtained from the international and transit branches of the service.*

The annual deficits of the internal service, such as are produced since 1860, can be valued as follows:—

TABLE VII.

Years.	Number of Telegrams.	EXPENSES.		Gross receipts.	Annual Deficit.
		per Tele- gram.	Total.		
1860	80,216	2.11	169,260	142,345	26,915
1861	97,945	1.92	188,050	171,226	16,824
1862	105,274	1.97	207,390	176,643	30,747
1863	188,825	1.50	283,240	211,064	72,176
1864	252,301	1.35	340,610	282,592	58,018
1865	332,721	1.27	422,560	345,289	77,271
1866	692,536	.90	623,280	407,532	215,748
1867	817,652	.91	744,060	469,749	274,310
1868	972,038	.92	894,270	549,263	345,007
1869	1,108,737	.86	953,510	598,740	354,770
Totals	4,648,245	1.04	4,826,230	3,354,443	1,471,786

The progression of the annual deficit in the last column, Table VII., does not represent alone the effects of the reductions upon

the internal traffic. These reductions, in augmenting this movement, enormously reduced the cost of the unit of work, not only for interior but for all classes of correspondence.

The benefit which international correspondence derives from this result ought for the most part to be carried to the reduction of the deficit debited to the interior service. This will be seen further on.

In the sequence of the cost of these ten years we see at first the mean of 1860 and 1861 maintain itself, rising a little in 1862. There was, in fact, during these three years, only a partial reduction of tariff applied to a small part of the traffic.

In 1863 the interior tariff is lowered from 1.50 frs. to 1 fr., and the cost is diminished one quarter. From this year the cost diminishes slightly until 1865, also in consequence of partial reforms in the international relations; but in 1866 a sudden decrease in the cost of working takes place, due to the last reduction of tariff for the interior, after which the mean is maintained with very little variation.

We ought then to admit that if all the tariffs were maintained the cost of working would remain the same, the inevitable increase of expenses being compensated by the economies which would result from the normal progression of the movement.

These points established, we can reconstitute approximately the traffic of the ten years such as it would have been under the tariffs of 1860, supposed to be maintained with both international and internal telegrams, a supposition which has already been applied to the whole of the operations. Table VI.

The progression, the receipts, and the expense of the interior service remain for the years 1860, 1861, and 1862 what they were in reality.

After January 1st, 1863, the date of the reduction of the tariff to 1 fr. from 1.50 frs., the progression and the receipts will be regulated by the normal rate which has already been established as the basis of comparison.

The expense of the interior telegrams will be maintained at 2 frs. per telegram, the exact mean of the price given, Table VII. for 1860 to 1862 inclusive.

These valuations are embraced in the following Tables, VIII., IX., and X.

TABLE VIII.
INTERIOR TRAFFIC.

Years.	Estimated Traffic, without the reduction of rates.			Estimated Annual Expenses.	Estimated Annual Deficits.	Excess of Real Deficits upon Estimated Deficits.
	Rates of Progression.	Number of Messages.	Receipts.			
1860		80,216	142,345	169,260	26,915	
1861	..	97,945	171,226	188,050	16,824	
1862	..	105,274	176,643	207,390	30,747	
1863	12	117,910	197,840	235,820	37,980	84,196
1864	17	137,957	231,470	275,900	44,430	18,588
1865	18	155,880	261,560	311,760	50,200	27,071
1866	14	177,700	298,180	355,400	57,220	158,528
1867	6	188,360	316,070	376,720	60,650	213,660
1868	6½	200,500	336,610	401,000	64,390	280,617
1869	10½	221,550	371,950	443,100	71,150	283,620
Totals	..	1,483,292	2,503,894	2,964,400	460,506	1,011,280

We see that under the tariff of 1860 the interior telegraphy would have continued to produce an always-increasing deficit.

In order to appreciate the loss by the application of reduced tariffs, it is necessary to deduct from the loss placed to the debit of the interior service the amount gained by the international and transit services, in consequence of the reduced rate augmenting the number of interior messages, thereby reducing the cost of working upon all classes of messages.

Tables IX. and X. give these amounts—

TABLE IX.
INTERNATIONAL TRAFFIC.

Years.	Number of Messages.	Gross Receipts.	Expenses.		Direct Profits.	Estimated Expenses.		Reduced Profits.	Differ- ences.		
			Per Message.	Total.		Per Message.	Total.				
			1	2		3	4	5	6	7	8	9	10
1860	95,199	232,877	f. 1	f. c. 27	120,900	f. 111,977	f. 1	f. c. 27	120,900	f. 111,977	f.
1861	115,121	257,748	1	15	192,890	125,358	1	15	192,890	125,358	
1862	129,985	280,449	1	18	158,320	127,129	1	18	158,320	127,129	
1863	162,178	277,266	0	90	145,960	181,806	1	07	173,530	108,736	27,570
1864	197,547	307,956	0	81	160,010	147,946	1	01	199,520	108,486	39,510
1865	252,188	340,104	0	76	191,620	148,484	1	01	254,650	85,454	63,080
1866	306,596	360,900	0	54	165,560	204,340	0	90	275,940	93,960	110,380
1867	338,918	409,291	0	55	186,400	222,891	1	02	345,700	68,591	159,300
1868	376,699	424,139	0	55	207,180	216,959	1	05	395,530	28,609	188,350
1869	425,676	450,577	0	51	217,090	233,487	0	97	412,910	87,667	195,820
Totals..	2,400,002	3,350,907	0	70	1,680,480	1,669,877	1	02	2,464,390	885,917	783,960

TABLE X.
TRANSMITTED TRAFFIC.

Years.	Number of Messages.	Gross Receipts.	Expenses.		Direct Profits.	Estimated Expenses.		Reduced Profits.	Differ- ences.		
			Per Message.	Total.		Per Message.	Total.				
			1	2		3	4	5	6	7	8	9	10
1860	50,404	152,522	f. 0	f. c. 84	42,840	f. 110,182	f. 0	f. c. 84	42,840	f. 110,182	f.
1861	55,902	159,559	0	77	43,040	116,519	0	77	43,040	116,519	
1862	56,578	147,952	0	79	44,700	108,252	0	79	44,700	108,252	
1863	65,110	124,038	0	60	39,070	84,963	0	71	46,280	77,803	7,160
1864	96,649	198,851	0	54	52,190	146,661	0	67	64,750	134,101	12,560
1865	89,183	180,247	0	51	45,480	134,767	0	67	59,750	120,497	14,270
1866	128,873	184,781	0	36	46,890	138,391	0	60	77,320	107,461	30,980
1867	132,149	192,428	0	36	47,570	144,868	0	68	89,860	102,568	42,290
1868	153,662	223,700	0	37	56,990	166,770	0	70	107,700	116,000	50,770
1869	188,173	273,455	0	34	63,980	209,475	0	65	122,310	151,145	58,330
Totals..	1,016,883	1,837,528	0	47	481,690	1,355,888	0	68	698,000	1,139,528	216,810

The columns 1 to 6 present the results of the International and Transit Traffic, with the profits they have realised after spreading the expense of working, such as has been given for the interior service, over all classes of telegrams.

Column 7 gives the series of prices of each telegram upon the hypothesis of the interior tariff being maintained alone. Without the Interior reforms the International and Transit Traffic would not have benefited by the considerable augmentation of the number of units of work, and they would have cost the administration more.

This gives (Column 8) a series of supposed expenses, which, deducted from the effective receipts, gives (Column 9) the reduced profit. This latter, deducted from the real profit, leaves (Column 10) the *part of the profit which could not have been realised if the interior reforms had not taken place.*

It is necessary, then, to carry to the credit of the Internal Service this sum of 783,960 francs, which has been added in 7 years to the benefit of the International Branch by the reforms of the Interior Branch, and to this must be added the sum of 216,310 francs, the benefit which the Transit Service has derived from the same source, giving a total of 1,000,270 frcs.

This sum will compensate within a few thousand francs the sum found in Table VIII., as representing the direct augmentation of the deficits of the internal service in consequence of the reductions of tariffs.

But, in order to be more exact, it is necessary to consider a contrary re-action—that is, the effect produced by the reductions of the international tariffs upon the lowering the unit of expense applied to the internal movement. If these reductions had not taken place we find that the mean return of the price of interior telegrams reproduced in the second column of the following Table XI., conformably to Table VII., would have been a little increased, such as we see it in Column 3. The difference in Column 4 being applied to the real number of interior telegrams, indicates how much this part of the traffic owes to the augmentation of correspondence with foreigners resulting from the successive reforms of the International Tariff.

TABLE XI.

Years.	Mean Cost of Internal Telegrams.		Differences.	Number of Telegrams in the Interior.	Result of the reduction of International Tariffs.
	Actual.	Supposing the International Tariffs maintained.			
1863	1 50	1 55	,, 05	188,825	9,441
1864	1 35	1 40	,, 05	252,301	12,615
1865	1 27	1 33	,, 06	332,721	19,963
1866	,, 90	,, 93	,, 03	692,536	20,776
1867	,, 91	,, 94	,, 03	817,652	24,529
1868	,, 92	,, 95	,, 03	972,038	29,161
1869	,, 86	,, 89	,, 03	1,108,737	33,262
				Total... 149,747	

This sum being deducted from 1,000,270 francs, there remains 850,523 francs to deduct from the increased deficit of Table VIII.; this leaves 160,757 francs as the approximate loss in seven years in consequence of all the internal reforms.

RÉSUMÉ.

In 1862, with a tariff of Fr. 1.50 for all Belgium, there were 105,274 telegrams for the Interior.

The expense exceeded the receipts by 30,747 francs.; and this deficit was destined to increase year by year (see Table VIII.), each telegram costing 2 francs., whereas it only received a mean of about franc. 1.70 cts.

The tariff is reduced in 1863 to 1 franc., and to 50 centimes in December, 1865.

There followed such a development of correspondence, that in 1869 the number of telegrams exceed *tenfold the number in 1862*.

During the same time the total receipts for the Interior, which in 1862 were 176,643 francs., increased to 598,740 francs. in 1869.

The expense follows a progression equally rapid, but the whole cost to the public treasury for the increase of the traffic tenfold in *seven* years remains at francs. 160,757 = £6,430.

This difference cannot alone explain the diminution of the net product as given in the last column of Table IV.; there must be some additional loss upon the International correspondence, and

by applying the same series of deductions to this class of traffic as have already been applied to the Internal correspondence, we arrive at a further loss of benefit by the reduction of the tariff upon International correspondence.

Table IX. indicates the benefits resulting from the division of the expenses in proportion to the work done.

This rises to 1,669,877 frs. for the last ten years.

The following summary indicates what would have been produced in this branch of traffic if the tariff of 1860 had been maintained.

TABLE XII.

Years.	Estimated International Traffic without the Reduction of Tariffs.			Estimated Annual Expenses.	Estimated Annual Profits.	Actual Net Receipts, Table IX Column 6.	Annual Reduction of Profits.
	Rates of Progression	Number of Messages.	Receipts.				
1860	.. 15	95,199	232,877	120,900	111,977	111,977	..
1861	.. 9	109,480	267,810	139,040	128,770	125,358	3,412
1862	.. 12	119,830	291,910	151,550	140,360	127,129	13,231
1863	.. 17	183,650	826,940	169,740	157,200	131,906	25,894
1864	.. 18	156,370	882,520	198,590	183,930	147,946	35,984
1865	.. 14	176,700	432,250	224,410	207,840	148,484	59,356
1866	.. 6	201,440	492,760	255,880	236,930	204,840	32,590
1867	.. 6 $\frac{1}{2}$	213,530	522,930	271,180	251,150	222,891	28,259
1868	.. 10 $\frac{1}{2}$	227,410	556,280	288,810	267,470	216,959	50,511
1869	..	251,290	614,690	319,140	295,550	233,487	62,063
Totals ..	1,684,399	4,120,367	2,139,190	1,981,177	1,669,877	311,300	

This Table assumes the cost of each International telegram to remain as it was in 1860, at fr. 1.27, and to be maintained during the whole ten years; the conditions as to tariff remaining the same for *all branches of traffic*, and the increase of necessary expenses compensating for the advantage of the normal increase of correspondence.

The last column of Table XII. does not furnish the exact diminution of the net receipts resulting from the reduction of the International tariffs. This relative loss ought to be augmented by the effect of the reaction produced by the reforms of the interior service, (Table IX., last column,) and diminished by the favourable effect reciprocally produced by the development of the International correspondence upon the results of the Interior service. (Table XI.)

This gives for the last nine years the following losses :—

TABLE XIII.

Years.	Reduction of direct Profits. (Table XII.)	To be added as the effect of the interior Tariff. (Table IX.)	To be deducted as the effect of the International Tariff. (Table XI.)	Balance due to the International Traffic.
1861	Francs. 3,412	Francs. ...	Francs. 2,938	Francs. 474
1862	13,231	...	4,211	9,020
1863	25,894	27,570	9,441	44,023
1864	35,984	39,510	12,615	62,879
1865	59,356	63,030	19,963	102,423
1866	32,590	110,380	20,776	122,194
1867	28,259	159,300	24,529	163,030
1868	50,511	188,350	29,161	209,700
1869	62,063	195,820	33,262	224,621
Totals	311,300	783,960	156,896	938,364

We see that there is in the International traffic some diminution in the benefits, which increases relatively to what would have been the result had the tariff of 1860 been maintained, and that these diminutions increase in nine years to 938,364 francs.

This loss, added to 160,757 francs the loss on the Internal service, gives the sum of 1,099,121 francs to deduct from the net product of the last nine years.

The total of the net profits for 1861 to 1869 inclusive is 1,263,693 francs.

In multiplying by nine, the maximum annual receipts before this period, which was 240,712 francs in 1859, the product is

2,166,415 francs, and exceeds the real product only by the sum of 902,722 francs. This is, as already said, upon the hypothesis of the nominal progression at the higher tariff equalling only the inevitable increase of expense.

It cannot be doubted that the increase would at least have equalled this amount, and there is every probability that it would have considerably exceeded this, incontestably proving that a diminution of tariff never can produce the same amount of revenue as a higher tariff.

M. Jamar then argues that either his hypothesis exaggerates by one-tenth the losses resulting from the reduction of tariff, or (which is probable) that the net profits would have been the same without any reduction of tariff.

Either alternative can be adopted without altering the value of the following conclusions :

RESULTS FROM THE FOREGOING TABLES.

The net product of the Belgian Telegraphic system has been diminishing for several years, and was reduced to a point at which there was scarcely any profit in 1868.

Nine-tenths of this ought to be attributed to the successive reductions of the tariff upon International telegrams, and the remainder to the reduction upon Interior telegrams.

It is true that the Interior service, considered separately, produced a deficit before the reforms of 1863 and 1865. These reforms have slightly augmented the deficit, but this augmentation is only 160,750 frcs. for seven years.

It is equally true that the International service has always given a benefit, but the successive reductions of tariff with foreign countries have reduced this profit 938,300 frcs. in nine years as compared with what would have been the result had the tariff of 1860 been maintained.

On this supposition there would have been from 1863 to 1869 inclusive, 1,199,850 interior telegrams. The reduced tariffs have given 4,364,810 ; that is, 3,164,960 more in seven years, or 452,000 per annum. For this quadruple movement the public have to pay with the sacrifice of 160,750 frcs.

By the same reasoning there have been from 1861 to 1869 inclusive, 1,589,200 telegrams exchanged between Belgium

and foreign countries. The reduced tariff has increased this to 2,304,803, an increase of 715,603 in nine years, or 79,510 per annum. This augmentation of 45 per cent. has diminished the receipts by the amount of 938,300 frcs.

There is, then, an enormous difference in the results of reduced tariffs upon *Internal* correspondence as compared with *External* correspondence, and if we examine separately the effects produced by international relations, even the most intimate, we shall see that the confirmation of this difference is easy to find.

In dividing the telegraphic correspondence according to its nature, we find:—

	<i>Telegraphic Correspondences.</i>		
	<i>Interior.</i>	<i>International.</i>	<i>Total.</i>
Messages of Governments and of diplomatic offices	0 $\frac{1}{2}$	0 $\frac{1}{2}$	0 $\frac{1}{2}$
(Money Market). Stock Exchange news, &c.	5	12 $\frac{1}{2}$	8 $\frac{3}{4}$
Commercial transactions ..	34	56 $\frac{1}{4}$	45
Private and family relations ..	59 $\frac{1}{2}$	28 $\frac{1}{4}$	44
Newspaper telegrams ..	1	2 $\frac{1}{4}$	1 $\frac{3}{4}$
	100	100	100

Contrary to the general supposition, the correspondence of the Government, the affairs of the Bourse and news for the press far from constituting the principal object of telegrams, are only 11 per cent. of the total, 6 $\frac{1}{2}$ per cent. for the interior, and 15 $\frac{1}{2}$ per cent. for International Service.

The lines are occupied nine-tenths of the time by two principal currents. There is a more or less eager demand for the use of the telegraph for Commercial affairs, according to the variations of political or financial conditions.

The relations of social and family life gradually become more and more accustomed to the use of the telegraph, owing to the reduction of tariff bringing it within the scope of classes with moderate incomes, and engaged in small transactions.

As may be imagined these two currents of correspondence are not of equal importance within the limits of a country and outside those limits.

Social and family relations are never so numerous outside the frontier of any country.

They are only 28½ % in the International correspondence, while they constitute 59½ % of the Internal traffic.

In compensation, however, the commercial telegrams absorb 56½ % of International correspondence, and 34 %, only of the Interior.

Before the reduction of tariff, the proportion of Internal correspondence was the same, but the proportion of commercial correspondence was 63 % of the International movement; more, therefore, than it became with a reduced tariff.

It is thus evident that this class of correspondence follows above all, in its movement, the fluctuations of commerce, and is only influenced in a secondary degree by the alteration of tariff.

And as commercial affairs constitute the principal object of international correspondence, we cannot hope to increase these relations by any tariff cheap enough to augment the correspondence to anything resembling the increase of telegraphy within the state.

The benefit must be much less since there are so few people to profit by it.

It must cost more because no similar augmentation can take place to reduce the expense of working, such as we see in relation to the Internal correspondence.

RÉSUMÉ.

In resuming under form of principles the result of experience, such as the foregoing pages have analysed, we consider as demonstrated—

1st. *That a reduction of tariff leads to a diminution of the net product, even under the most favourable conditions known.*

2nd. *That the Interior service already producing a deficit before the last reduction of tariff, has obtained by these reductions an enormous increase of correspondence, with, however, a slight augmentation of the deficit.*

3rd. *That the International service which has always given a profit, has realised under similar conditions a development of correspondence much less, and a diminution of benefit much greater than has resulted to the Internal service.*

4th. *With the Interior correspondence the deficit tends to diminish,*

while with the international correspondence the diminution of benefit tends to increase.

From these facts Belgium assumes, that the motives of public interest which determine a reduction of tariff for internal service, are not those generally applicable to the International Service; and he suggests that the tariff should be continued unaltered until the natural increase of traffic has swelled the receipts to a sufficient amount to recoup the expenditure.

We will now consider how far the traffic of the different private Telegraph Companies is affected by the foregoing principles.

ATLANTIC TELEGRAPHY.

There are many and sufficient reasons which render it inexpedient on my part to publish all the details of private companies which are open to me, and have been well considered with the desire to find material of some practical value for this paper.

It must be sufficient for the present to prove that even under the most favourable conditions for *international* telegraphy the world can produce there is no exception to the rule, "That a reduction of tariff leads to a diminution of the net product."

The actual earnings of the Atlantic Telegraph Companies from 28th July, 1866, to 31st December, 1871, were	...	...	£2,171,000
Assuming the tariff to have remained at £12.84 (the mean for the first 11 months), and the traffic to have increased annually at the rate of $12\frac{1}{2}\%$, the gross earnings would have amounted to	...	...	£2,518,000
Difference in favour of £12.84 tariff	...		£347,000
Add—Expenses which would not have been incurred	...	...	£97,000
Total.....			<u>£444,000</u>

THE DURATION OF THE DIFFERENT TARIFFS WAS AS
FOLLOWS:—

£	s.	d.		
20	0	0	28th July to 31st Oct., 1866	... 3 months 4 days.
10	0	0	1st Nov., 1866, to 30th Nov., 1867	1 year 1 month.
5	5	0	1st Dec., 1867, to 31st Aug., 1868	9 months.
3	7	6	1st Sept., 1868, to 31st May, 1869	9 months.
2	0	0	1st June, 1869, to 9th Aug., 1869	2 months 9 days.
1	10	0	10th Aug., 1869, to 11th Dec., 1870	1 year 4 months.
3	0	0	12th Dec., 1870, to 30th June, 1871	6 months 19 days.
2	0	0	1st July, 1871, to 31st Jan., 1872	7 months.

The above Statement assumes the mean tariff for the first twelve months to be maintained, and 12½ per cent. as the normal rate of increase of traffic for each year, an increase which would only have produced an average of 114 messages per day for the year ending December, 1871, less than one-fourth of the real traffic, and a number so low that no one can suppose it would not have been attained even with the tariff at £20.

Could the high tariff have been maintained one cable would have sufficed for the limited traffic, all the capital and working expenses of the French Atlantic Cable would have been saved, and the Anglo-American Company would now be enjoying 27 per cent. dividend upon a capital of £1,675,000.

If, then, this small number of messages would have yielded a larger revenue than the greater number with the series of reduced tariffs given above, it follows that some other motives than cheapness must prevail to induce any private company to reduce their tariff.

These motives have hitherto been expediency, competition, and the attempt to combine and stave off further opposition; and we shall probably see reproduced the experience of the competing Land Lines in this country already referred to, “*One or more will be ruined or forced to amalgamate; higher tariffs will be resorted to in order to preserve good dividends with a large reserve, and further extensions will be avoided.*”

We have already three Atlantic Cables laid and in good working order, represented by a capital of ..	£3,675,000
There are two additional cables projected, one to be laid by the French Atlantic Company at a cost of £900,000, and another by the Great Western Telegraph Company, whose capital is £1,350,000, making together ..	2,250,000
Total ..	<u>£5,925,000</u>

The revenue earned by the Atlantic Cables, including the Newfoundland Company's proportion, amounted, as far as can be ascertained from the published accounts of the Companies for the year 1871, to £610,000. During the first six months of that year a £3 tariff was in force, and during the last six months £2 was charged. Taking the mean rate of £2 10s. we can assume that 245,000 messages were sent.

From existing data we can say that the normal increase of traffic may be estimated at 25 per cent., which would give a total of 306,250 messages for the current year, and 382,812 for 1873.

The effect of lowering the tariff from £2 to £1 will probably be to increase the number of messages 75 per cent. in the first year after the reduction.

As the two new cables cannot be laid until after the lapse of the first six months of next year, we may estimate the number of messages for the June half-year of 1873 at 191,406; these at a £2 tariff will give a revenue of .. £382,812

Upon the assumption of a £1 tariff increasing the traffic 75 per cent. the number of messages for the second half of 1873 would be 334,960, and the total revenue for the six months	334,960
Together	<u>£717,772</u>

Estimating the expenses attending the working of the 5 cables at £110,000 per annum, the balance of revenue for 1873 would yield upon the gross capital about 10 per cent. for dividend and reserve.

But for 1874, supposing the regular increase of traffic to be 25 per cent. upon the number of messages sent in 1873, the total revenue at a £1 tariff would only be £657,957, and this less working charges would return on the gross capital 9 per cent. for dividend, reserve and repairs.

I must, however, state that this is probably the worst view of the case as regards the traffic—what may be required for repairs, and how much wasted upon competition, I need not now consider.

Better results might be shewn if the traffic of the last two years were alone referred to, but we cannot always rely upon Alabama disputes and Erie Ring contests; and in calculating the probable results of the next few years, we may reasonably expect that there will be one year at least without much, if any, increase.

There are fluctuations in the commercial world which it would be folly to ignore, and I give the above figures as the minimum which may safely be anticipated; but who can say what the maximum would be if it were sought to establish *only a self-supporting instead of a dividend-earning system*.

We must, however, at once discard all idea of ever making the tariff so low as it is for interior telegrams, the local relations do not exist to any extent requiring an outlay of even 10s. for a telegram. No one can order his dinner by telegram. The small tradesmen in the suburbs and provincial towns cannot order their daily or weekly supply of goods by telegram. All the questions of minor importance relating to the inner life of a nation have no equivalent outside the limits of any country.

But still it cannot be disputed that Atlantic telegraphy under a self-supporting tariff, would within ten years require several additional cables. The interchange upon a grand scale of the products of the old and new world. The intimate political relations with this country, possessing as we do a great dominion extending from the Atlantic to the Pacific Ocean Islands, besides islands bordering upon the United States. The demand for the investment of capital by all the Teutonic and Scandinavian States in Europe, both in the State loans and in railways, promoting, as it

does, eager speculation and ever-increasing activity in this class of correspondence, all combine to create activity in international correspondence worthy of a great sacrifice to develope, and certain to result in a great international benefit. But no one will expect that this sacrifice should be met by private investors.

INDIAN TRAFFIC AND TARIFFS.

Dates.	Tariff.	Number of Messages.	Per centage of Increase.	Per centage of Decrease.	Receipts, calculating each message at 1 $\frac{1}{4}$ rate.	Per centage of Increase.	Per centage of Decrease.
1865	£ s. d.	28,832	..	..	147,288	..	..
1866	"	29,246	25.34	..	184,615	25.34	..
1867	"	29,064	..	0.62	188,466	..	0.62
1868	"	33,005	13.55	..	208,844	13.55	..
1869	2 17 0	44,215	33.96	..	157,515	..	32.26
1870	"	62,855	42.15	..	226,969	44.09	..
(average.)							

Average Increase per annum from 1865 to 1868, with the same rate of Increase and the same Tariff, £5. 1s. 0d.	Estimated number of Messages for 1869, with the same rate of Increase and the same Tariff, £2. 17s. 0d.	Actual number of Messages for 1869 with reduced Tariff £2. 17s.	Per centage of Increase of Messages consequent upon lowering the Tariff from £5. 1s. to £2. 17s.	Average Increase per annum from 1865 to 1868, with the Tariff at £5. 1s. 0d.	Receipts.	Estimated Total Receipts for 1869, with the same rate of Increase and the same Tariff £5. 1s.	Actual Total Receipts for 1869, with reduced Tariff of £2. 17s.	Per centage of Decrease of Total Receipts consequent upon lowering the Tariff from £5. 1s. to £2. 17s.
8,224	36,229	44,215	22.01	£ 20,354	£ 228,698	157,515	45.19	

We now come to raising the rate again to £4. 10s.

Actual number of Messages for 1870, with Tariff, £2. 17s.	Actual number of Messages for 1871, with Tariff, principally at £4. 10s.	Per centage of Increase of Messages.	Receipts for 1870 with Tariff £2. 17s. (calculating each Message at $\frac{1}{4}$ rate).	Receipts for 1871 with Tariff principally at £4. 10s.	Per centage of Increase of Receipts.
62,855	62,964	0.17	£ 226,969	£ 387,316	48.61

These Tables prove conclusively that raising the tariff did not decrease the number of messages, while it increased the revenue 49 per cent.

From 1865 to March, 1870, the communication with India was so unreliable that there were frequent complaints of letters reaching their destination sooner than telegrams, which were often unintelligible when they did arrive.

The uncertainty of telegrams being sent in their order, or of arriving at all, was loudly complained of, and yet we find a decided tendency to increase.

The year 1867 shews a slight decrease, but it has nothing to do with tariff; there was no change in that.

1868 gives 13.55 per cent. increase and gross receipts amounting to £208,344.

The tariff is then lowered at the instigation of the Telegraphic Convention, urged upon the principle that the benefit to the public would be very great.

The effect of lowering the tariff from £5. 1s. to £2. 17s. 6d. was to increase the number of messages 34 per cent., and to decrease the gross revenue 32 per cent.

At this point in March, 1870, two efficient telegraph lines were opened from England to India; both of them (with only a few interruptions, never occurring at the same time) have carried this class of correspondence in popular phrase "quicker than the sun itself," and it is acknowledged that this element increases International Telegraphy more than any other.

A large part of the increase subsequent to that date must therefore be attributed to these new facilities; and as a proof of this, I may relate some efforts made to augment correspondence.

We expended thousands of pounds in advertising and in communicating with everyone likely to have any commercial or social relations in the East.

We tried to enlist the press and gave telegrams of public interest for half price to the Reuter Telegraph Company.

We employed boats to go on board every steamer at Gibraltar, Malta, Suez, and Aden, and it is on record as a matter of experience that we did not get 2 per cent. of social messages from all our efforts in the first direction named; we found that India could not supply the Reuter Company with a telegram every day worth publishing. Somebody had gone to the hills, or some body was leaving Madras and going somewhere else, formed the class of telegrams sent from India, and nobody wanted them, nor did we by employing boats to visit ships with passengers voyaging to and from all parts of the East, obtain six messages in the six months.

During the great Continental war we were eagerly sought to give news to Gibraltar, Malta, Egypt, Aden, and the Mauritius but as the killed and wounded diminished, the thirst for telegrams subsided, and I do not think they would have given us quarter rates for a daily telegram.

I make these statements as further confirming the principle that the social relations which exist outside the limits of a country do not give any appreciable addition to telegraphic correspondence; questions of urgency, for which even 20s. would be expended, are not frequent, and these questions are more apt to be nearer home than several thousand miles away.

It must be accepted as a feature of telegraphic correspondence that commerce gives at least 90 per cent. of all International Telegrams, where the countries are remote.

Belgium, we have seen at the end of my extract, gives 63 per cent. for International Commercial Telegrams before the tariff was lowered and 56 per cent. after it was lowered, that is more

in proportion with a high tariff than with a low tariff, proving that tariff only affects this class of correspondence in a secondary degree.

We find then, that these new routes to India, the Indo-European, and British-Indian Submarine, increased the correspondence 42 per cent., bringing it up to nearly double the amount it had attained in its best year under the higher tariff of £5. 1s. 0d., but this double number of telegrams, "carried quicker than the sun," at a tariff of £2. 17s. 0d. only produced £18,000 more than the old slow and unreliable line at the high tariff of £5. 1s. 0d.

The result of this competition was that the Turkish line was losing upwards of £20,000 per annum, the Indo-European line was not paying, and the British-Indian line was earning a meagre 5 per cent. for the purposes of dividend, reserve, and maintenance.

Early in 1871, the tariff was increased to £4. 10s. 0d., and the effect of this increase was not to diminish the traffic, but with the same traffic to increase the revenue 48 per cent.

It may be argued that the increase of tariff stopped the immediate increase of traffic, but that cannot in justice be affirmed. The great continental war suspended many commercial operations, numerous engagements of tonnage and orders for goods were cancelled, and for many months transactions were limited to those bearing the minimum of risk.

The experience, then, of Indian traffic confirms all the foregoing principles, and it follows that if we are to have a low tariff calculated to stimulate this class of correspondence, increase commercial activity and make telegraphy more a habit of the people in India, it must be done at a sacrifice of dividends at least, and these are for the present at as low a point as private investors will encourage.

We propose from the first of next month to reduce the tariff from £4. 10s. to £4, and there is a hope that the traffic will be elastic enough to recoup within the first year the loss from this moderate reduction. Government alone can afford to bring the tariff to £3, a tariff which would keep the lines self-sup

porting and provide for the extensions which the certain increase of commercial activity from this cause alone would demand.

It should not be lost sight of that, while a very low tariff would unquestionably increase the correspondence considerably, it would also necessitate the addition of more lines, which over so great a distance can never be done without a large expenditure of capital ; and as it is proved that this class of correspondence is principally commercial, it must be kept self-supporting at least, even if controlled by Government, or taxpayers may well object to share a burden so specially advantageous to the commercial classes, and only in a secondary degree of general benefit to the whole community, nothing more than a gradual and moderate reduction below £3 for 20 words, even under Governmental control, could therefore be anticipated.

It is proper here to call attention to what India has already done, and what they appear to be sacrificing in the interests of telegraphy.

The following table shows that India in the year 1869 exchanged fewer telegrams of all kinds than Turkey or Roumania, and very few in excess of Denmark, and taking the statement published by the International Telegraph Office of Berne, as I find it, they appear to lose upon every telegram 4s. 6*½*d.

TABLE XIV.
Statement of the Average Cost, Product, Profit, and Loss per Telegram for 1869.

STATES.	Number of Messages for 1869.			Total Working Expenses for 1869.	Average Cost per Telegram for 1869.	Total Receipts for 1869.	Average Product per Telegram for 1869.	Average Profit per Telegram.	Average Loss per Telegram.	s. d.
	Internal.	Inter-national.	Service.							
Austria and Hungary	2,807,958	1,281,796	146,035	4,235,789	280,457	1 3 <i>1</i> ¹	292,409	1 4 <i>1</i>	0 0 <i>1</i>	..
Baden	126,429	481,765	289,884	898,078	13,996	0 3 <i>1</i>	15,122	0 4	0 0 <i>1</i>	..
Bavaria	262,649	598,066	..	868,705	21,866	0 6	35,213	0 9 <i>1</i>	0 3 <i>1</i>	..
Belgium	1,108,737	613,849	315,722	2,038,308	51,967	0 6	52,943	0 6 <i>1</i>	0 0 <i>1</i>	..
Denmark	186,979	222,188	10,453	419,620	18,044	0 10 <i>1</i>	16,331	0 9 <i>1</i>	..	0 1
France	4,729,588	1,579,717	..	6,309,305	413,320	1 3 <i>1</i>	426,264	1 4	0 0 <i>1</i>	..
Germany (North)	4,028,764	2,168,274	69,460	6,266,498	335,399	1 0 <i>1</i>	307,897	0 11 <i>1</i>	..	0 1
Great Britain, INDIA	481,824	40,852	..	522,676	264,070	10 1 <i>1</i>	145,042	6 6 <i>1</i>	..	4 6 <i>1</i>
Greece	96,213	13,335	3,260	112,808	15,506	2 8 <i>1</i>	6,970	1 0 <i>1</i>	..	1 8 <i>1</i>
Holland	949,562	682,390	11,338	1,643,390	62,181	0 9	46,300	0 6 <i>1</i>	..	0 2 <i>1</i>
Italy	1,643,147	693,309	71,407	2,407,863	158,608	1 3 <i>1</i>	188,736	1 6 <i>1</i>	0 3	..
Norway	266,163	140,966	21,977	429,105	26,874	1 3	27,601	1 3 <i>1</i>	0 0 <i>1</i>	..
Roumania	434,590	162,450	1,076	598,116	55,007	1 10	41,866	1 4 <i>1</i>	..	0 6 <i>1</i>
Russia	1,886,849	391,743	120,818	2,399,410	330,041	2 9	492,628	4 1 <i>1</i>	1 4 <i>1</i>	..
Spain	742,087	265,280	78,084	1,072,461	137,001	2 6 <i>1</i>	70,639	1 3 <i>1</i>	..	1 2 <i>1</i>
States of the Church	40,250	68,639	2,296	111,186	5,613	1 0	4,712	0 10	..	0 2
Sweden	384,128	211,833	702,551	1,298,512	40,356	0 7 <i>1</i>	49,306	0 9	0 1 <i>1</i>	..
Switzerland	951,387	418,087	24,692	1,394,016	36,924	0 6 <i>1</i>	42,134	0 7 <i>1</i>	0 1	..
Turkey	476,342	194,978	..	671,320	161,168	4 6	209,601	6 2 <i>1</i>	1 8 <i>1</i>	..

Note.—India—These figures are approximately exact; the financial year terminating in March, all accounts are made up to that date.

I do not know whether the telegraph department in India credits itself with a charge upon all Government and political telegrams; if not, then the figures given do not in my opinion give full justice to the department. Belgium, Switzerland, and some other countries debit their Government as they do the public, in some cases however only at half-rates, but it is obvious that the capital expended upon any system should be credited with whatever benefits it yields, either of service to the State or service to the public.

From this enormous loss then, there should be deducted some amount representing the sum the country would gladly pay in money for the facilities of governing so vast a territory with 150,000,000 of inhabitants, so much under military control. There will no doubt be great sums saved annually in the movement of troops, more concentration, security, and economy entirely indebted to telegraphy, and therefore a direct gain to the State.

But assuming that the number of telegrams given in the preceding table represent the money-earning telegrams, and therefore the service rendered to the commercial public, it is at best a beggarly account for so great a territory, and can only be accounted for by the two following causes:

The uncommercial habits of the people; and

The tariff being so high in relation to the magnitude of the transactions common to the natives, having more resemblance to the amount paid in this country for international telegrams than to the amount common to this and every other nation for internal correspondence.

It is established that a reduction of tariff for interior traffic has nearly in every instance produced an enormous increase of traffic with only a slight increase in the deficit of the net product.

And that this deficit upon internal correspondence tends to diminish.

The Statement which follows shows what the Telegraphic system has cost the various States, from the earliest to the latest available data, proving that most countries think it worth a considerable sacrifice to obtain telegraphic communication: (Table XV.)

TABLE XV.
Statement, shewing the Total Expenses; Receipts, Profit and Loss, and average Yearly Profit and Loss, from commencement of Lines to 1869.

STATES.	DATE from	EXPENSES.		RECEIPTS.	LOSS.		PROFIT.	
		Working to 1869.	Establish-ment to 1869.		Total to 1869.	Average yearly.	Total to 1869.	Average yearly.
Austria and Hungary	1849	2,691,744	850,477	3,542,221	2,866,671	686,550	32,692	£
Baden	1851	1,239,396	40,790	1,661,086	1,338,606	32,480	1,709	..
Bavaria	1851	297,636	14,225	434,889	348,525	86,364	4,478	..
Belgium	1850	330,662	97,186	427,748	451,863	..	..	1,204
Denmark	1854	217,496	137,665	355,161	248,688	108,462	6,663	24,116
Germany (north)	1849	2,198,785	759,674	2,958,449	2,532,409	426,049	20,288	..
Holland	1852	472,164	193,658	661,832	489,966	175,897	9,772	..
Italy	1,407,214	104,056	1,506,270	1,926,386	240,884	-	30,110	..
Norway	1855	265,462	18,459	262,321	237,718	228,603	16,240	..
Russia	1846	2,769,842	1,064,426	3,833,867	3,116,750	717,167	51,222	..
Spain	1855	1,78,988	196,358	1,983,346	724,554	1,268,792	83,919	..
Sweden	1853	416,828	268,324	685,162	717,143	..	31,991	1,881
Switzerland	1852	320,138	66,741	386,879	383,144	..	6,265	348

TABLE XVI.
Statement showing the Total Number of Telegrams from the Opening of the Lines.

STATES.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.
Austria and Hungary	8,593	14,398	56,164	84,888	146,560	281,165	289,504	342,526	396,503	463,950	726,219	727,274
Baden	4,148	12,460	37,691	41,346	51,067	67,304	63,816	77,361	112,671	128,670	
Bavaria	2,404	6,228	15,527	24,726	61,217	85,457	153,581	128,147	142,497	216,382	205,450
Belgium	19,686	41,509	76,312	95,096	107,582	142,939	178,621	217,784	276,979	328,351	
Denmark	20,043	46,443	51,871	110,856	104,400	119,253	162,381	
France	9,014	48,105	142,061	236,018	255,432	360,299	413,616	463,973	817,473	977,281	
Germany	35,494	40,065	48,751	85,161	115,481	136,935	248,905	277,870	289,831	613,129	623,326
Greece	5,493	19,813
Holland	1,359	46,738	104,655	143,780	194,565	228,964	266,992	391,613	419,130	
Norway	1,868	32,918	68,020	83,011	97,174	124,363	142,876	
Portugal	13,945	39,500	52,000	62,000	
Russia	160,417	170,210	205,516	301,711	465,027
Spain	2,930	6,438	42,680	162,994	281,461	316,166	
States of the Church	173	730	11,996	22,585	30,423	39,523	48,490	45,982
Sweden	851	10,534	60,611	116,673	174,864	180,364	181,119	173,231
Switzerland	2,876	84,832	132,340	166,541	232,067	265,385	252,800	293,746	312,256
Wurttemburg	41,385	40,112	41,451	63,978	66,131	71,628	96,207	106,122

REMARKS.

BAVARIA.—Exclusive of Service Messages.

FRANCE.—In 1858, 1864, and 1865, the number of *Received International* and “*Transit*” messages is not included.

In 1863 *Received International* Messages are not included. Service Messages are not counted.

GERMANY.—The number of *Received International* Messages is unknown prior to 1859.

As regards the Tariffs no precise information can be obtained prior to 1865; they were, however, considerably reduced by the Paris and Vienna Conventions of 1865 and 1866.

TABLE XVI—*continued.*
Statement showing the Total Number of Telegrams from the Opening of the Lines.

STATES.	1861.	1862.	1863.	1864.	1865.*	1866.	1867.	1868.*	1869.
Austria and Hungary	919,789	1,021,612	1,105,501	1,692,610	1,899,808	2,658,089	2,914,904	3,259,273	4,235,789
Baden	148,350	182,246	226,655	307,399	396,367	499,701	689,647	630,959	898,078
Bavaria	230,192	265,758	319,408	396,581	490,935	605,403	756,049	709,284	858,705
Belgium	405,364	410,045	637,605	726,692	938,467	1,439,842	1,650,169	1,823,080	2,038,308
Denmark	197,417	208,160	238,634	170,210	203,208	237,367	316,892	357,397	410,520
France	1,268,459	1,976,144	1,895,930	2,694,361	3,107,394	4,330,791	4,645,604	5,029,245	6,309,306
Germany	741,085	967,321	1,222,692	1,767,679	2,197,090	2,806,216	4,379,777	5,560,947	6,266,498
Great Indo-European .....	..	..	..	256	23,433	29,246	29,064	33,005	46,389
Britain } Indian .....	..	..	..	..	..	..	..	..	622,876
Greece	29,664	47,027	57,409	62,513	85,457	102,870	106,435	101,837	112,808
Holland	535,733	632,567	807,811	972,394	1,094,803	1,120,226	1,506,802	1,643,390	
Italy .....	..	..	..	2,058,364	2,345,028	2,137,674	2,315,624	2,407,863	
Norway	135,561	146,101	131,697	216,158	242,176	290,098	333,835	378,915	429,105
Portugal	73,500	85,500	93,000	104,000	125,500	141,007	191,701	193,973	..
Roumania .....	..	..	297,810	310,045	352,829	438,158	475,686	557,181	598,116
Russia	627,061	714,919	816,983	927,358	1,044,376	1,416,351	1,589,417	2,028,949	2,390,410
Spain	348,022	636,279	605,588	819,952	1,006,252	901,614	793,829	784,887	1,072,451
State of the Church	36,255	42,316	63,844	68,180	97,792	106,901	116,317	101,520	111,185
Sweden	185,398	483,419	689,142	759,934	913,968	1,051,621	1,215,053	1,246,680	1,290,512
Switzerland	340,907	392,142	468,394	527,939	604,963	684,793	726,714	1,175,497	1,394,016
Turkey .....	..	..	..	..	..	..	..	..	671,320
Wurtemburg	148,826	175,426	197,454	268,130	337,779	422,249	435,149	498,513	..

REMARKS.

ITALY.—The number of Messages is unknown prior to 1865.

PORTUGAL.—No data for 1869.

ROUMANIA.—No data, obtainable prior to 1863.

WURTEMBERG.—No data for 1869.

* Tariffs reduced.

As regards the Tariffs no precise information can be obtained prior to 1865; they were, however, considerably reduced by the Paris and Vienna Conventions of 1865 and 1868.

Table XVI. gives the traffic for all the countries which have supplied this data to the telegraph convention, and by comparing the periods subsequent to the improved and diminished rates at the dates of the Telegraphic Conferences held at Paris in 1865, and in Vienna in 1868, with those anterior we find that unless disturbed by war or some exceptional conditions there is a very large and continuous increase in Telegraphic correspondence.

Belgium has established the benefit to be derived from the augmentation of telegraphic correspondence in decreasing the cost of working each internal telegram. In Table VII. we find the cost to the State per telegram, with the tariff at frcs. 1,50 cts., was in 1860, frs. 2,11 cts.; but in 1869, with a 50 cent. tariff, the cost was only 86 centimes, but this reduced tariff had produced 387,000 telegrams each year in excess of what would have been created under the *régime* of the high tariff.

It is this commercial activity which every State should encourage, as certain to add to the general prosperity and wealth-producing power of a nation, and bearing in mind the principle established, that the increase of internal telegrams with a low tariff is *enormous*, and the increase of deficit of net product only *slight*, with a tendency to diminish, I would submit to the telegraph department of India whether it might not be worth while to try a bold effort to introduce telegraphy into the habits of the Indian community.

I am of opinion this will never be done unless the tariff is reduced to some moderate standard represented by some small *current coin*, such as half a rupee.

The lines exist; the capital is expended; the stations are opened. The work can be greatly increased without material addition to the expenditure. There is no danger of competition upon any section which may prove exceptionally productive; such as all private companies must always apprehend.

It is more than probable that the indirect gain to the State will far more than compensate for the direct loss. Besides, as internal telegraphy grows, international telegraphy must also

increase (although not in the same proportion), and it is certain that upon every international telegram there is a large profit to the State to compensate for the loss upon the internal telegrams ; and this profit is all the greater, as the cost of working each telegram is diminished by an increase in the number of internal messages.

I know that the habits of the natives of India are unlike those of any European country, and I know, by experience, the indolent tendency of the climate ; but Manchester has found the way to make cheap fabrics such as the natives will buy, and the exports and imports between this country and India have increased from nothing at all to £44,394,083, in 1870. The railways have no doubt found a tariff which has induced the natives to travel ; is there no proportion of this amount, which will induce them to telegraph ? it is saving time in both instances ; without wishing to be at all dogmatic or pretending to know as much as the gentlemen at the head of the telegraphs of India already know, I submit these foregoing principles and considerations, as impressing me with the idea that a low tariff for internal correspondence in India might in a few years produce a marked change for the benefit and prosperity of the country.

THE EGYPTIAN TRAFFIC.

The line was first opened in 1861, at a tariff of £2 for 20 words ; and continued at the same rate until the summer of 1868, when it was reduced to 30s.

Up to this date the frequent interruptions, by the breaking of the old cable, which unfortunately was laid in shallow water, set all statistics at defiance. There are evidences of extreme fluctuations on account of the demand for cotton during the American Civil War ; then a reaction owing to the panic of 1866 ; then a change during the Abyssinian War,—in the midst of which the cable broke.

Since the new cable was laid in 1868 there has been uninterrupted communication. The opening of the Suez Canal in 1869, gave an exceptionally good year ; and then the war with

France and Germany produced, in 1870, an exceptionally bad year, and all the data we have will prove nothing excepting an aggregate increase; which can be represented by a progressive 12 per cent. increase per annum since the opening of the line.

There are no social messages between Europe and Egypt worth estimating. The whole are commercial, financial, and political, and are not influenced by tariff to any material extent. A reduction of tariff to £1 would not produce such good results as an improvement in the speed and accuracy; and every effort is being made to make the service between this country and Egypt so rapid that a merchant can rely upon a reply to his message within the office hours of each day.

Should this increase the traffic as much as I anticipate, then I believe a reduction of tariff would soon follow.

ARGUMENTS WHICH MAY BE EXPECTED TO INDUCE PRIVATE COMPANIES TO REDUCE THEIR TARIFFS.

I regret that I cannot think of any reason which should influence the Directors of private companies to reduce their tariffs beyond the single *one of expediency*.

The foregoing pages prove conclusively, "*That every reduction of tariff leads to a diminution of the net product.*"

It may be expedient to reduce tariff with the object of staving off opposition and satisfying a popular demand, but this is sufficiently questionable, for the following reason:—

A reduction of tariff means a sacrifice of revenue for a length of time; and after this sacrifice has been made and is about to be rewarded by the gradual increase of revenue to the original point, there will be others ready to bring out rival cables upon the first publication of favourable receipts.

There is the danger already referred to that after one company shall have made unproductive lines, they may be opposed upon the most productive sections by a new company with smaller capital.

I venture to say that these are points which never leave the minds of the Directors of private telegraph companies.

Many governments seem to delight in giving all sorts of concessions. We are never without a threat of opposition in one or more quarters, and there cannot be a more difficult question for the consideration of Directors than that of determining *when it is expedient to make the sacrifice of lowering the tariff or extending their lines.*

There is only one way by which the full benefit of telegraphy can be obtained for the public at the expense of private enterprise. Governments could give monopolies with expressed conditions of a maximum tariff, and reserve, and require that all revenue in excess of these amounts should be given to the public either in the shape of increased facilities or reduced charges.

The present insecure system is open every hour to competition, and can only result in amalgamation and higher tariffs, to provide dividends for the greater amount of capital unnecessarily expended. This amalgamation will probably only be effected after one or more companies have been almost ruined. I would, as a matter of private opinion, prefer the conditional monopoly referred to ; in granting which the Government could stipulate that 2 per cent. upon the capital should be laid aside for renewals, repairs, and extensions, before any dividend was given to the shareholders ; that this reserve should be continued and used for such extensions as the increase of trade demanded ; and that no dividend should be divided in excess of 8 per cent. until every facility in the shape of reduced tariff and extensions had been supplied to the public that the Government might judge to be desirable.

A reasonable limit in tariff would soon be established, below which no company would be expected to reduce ; this point attained, and a large reserve provided, the company should then be allowed to divide the whole of their revenue.

This plan, or some modification of it, would insure the maintenance of an efficient and reliable means of communication ; it would ensure to the commercial public a supervision which would give them a reduced tariff whenever it became reasonable to do so ; it would ensure to the shareholders a comparatively sound investment ; in a very few years the reserve and the duplication

of the lines, with the aid of this reserve, would make their dividend absolutely secure, but for this they would be required to sacrifice dividends, *if need be*, until their property had attained this sound position.

I commend the consideration of this subject to the shareholders, as the only basis upon which they could ask for, or the Government grant, a conditional monopoly.

At present we are not acting upon sound principles; most of the cable property is comparatively new, and large renewals may be required. The property is exposed to opposition from the increasing energies of a host of concessionaires seeking concessions, with the object of placing other and unnecessary schemes upon the public, or being bought off by existing companies.

It is exposed to the inroads of packing companies, who boast their power of paying large dividends upon a small capital, and point with triumph to their public spirit in preventing the companies, which established the lines at a cost of millions, from earning dividends at the expense of the commercial public, forgetting or not caring to remember, that if these companies do not pay a reasonably good dividend, and any accidents occur to the cables, then the capital could not be obtained to renew them; if telegraphy had to be maintained in such a case, the whole burden would fall upon the Government.

The Government is therefore interested in maintaining these lines, as a dividend-paying property, or they cannot be maintained in an efficient state. They can give the companies a security, and obtain for it a material advantage to the commercial public; nor is it too much to ask that the £10,000,000 of British capital invested should by some such form, or by Act of Parliament, be defended from a competition which has not only no public good to serve, but must absolutely endanger the very existence of lines which have become a necessity to imperial and commercial interests.

If this, or some similar, plan is not devised then the alternative is, that Government should obtain the whole of the telegraphs, and by making them only self-supporting, give the public the full advantage the system is capable of affording.

We have seen in the foregoing pages that the increase of *internal traffic* decreases the cost of working both internal and international telegrams. *Private companies obtain no benefit from this. Governments obtain all the benefit.*

It is established that lowering the tariff upon international messages diminishes the revenue directly derived from this class of correspondence, but it increases the traffic ; and it is certain that the increase of international traffic largely augments the increase of internal correspondence, both by telegraph and post-office, *Governments obtain all the benefit from this cause ; private companies cannot obtain any benefit whatever.*

All increase of telegraphy directly and certainly stimulates commercial activity, increases the wealth of a nation by multiplying transactions, enlarging incomes, thereby promoting a larger taxable surface for the benefit of the whole community and the amusement of the Chancellor of the Exchequer. Private companies can only obtain a minimum of advantage from the first effect, and none at all from the latter. *Government and the State are immediately benefited.*

Governments can, by *unity of management*, by *simplicity of through working*, by *uniformity of system*, effect an enormous amount of saving that cannot be approached under the system of private management.

Governments can, by absence of competition, extend the system to such points as the Mauritius, Cape of Good Hope, New Zealand, the Andaman's, Burmah, &c., &c., which, although comparatively unproductive, would yet, to a Government with a monopoly, become feeders to an extent which, in the aggregate, would be at least self-supporting. *No private Company can afford this luxury.*

It follows, then, that Government have every advantage in their favour, every possible reason in the interest of good Government and substantial benefit to the State to reduce all telegraphy to the point of being *simply a self-supporting system, not a dividend-paying system*, which it is the duty of private companies to maintain as long as possible.

There is one question in the minds of those who are not familiar

with the subject which can easily be answered. *What would become of all this property in time of war?* My answer to that is, there is sufficient enlightenment amongst all nations to arrange conditions to control or suspend one or more cables or land telegraphs during the operations of war without resorting to the barbarism of destroying them ; this was done during the civil war in America, and the telegraph remained intact to become the messenger of peace.

There is another important consideration in relation to this part of the subject : How will Government obtain possession of all these cables ? but as that is not the subject of this paper, and not becoming in me to suggest or advocate, I shall leave it to others who may think it worthy of their attention.

I had no desire or intention of advocating the purchase of the lines by Government, nor yet did I intend to find reasons for the maintenance of a higher tariff upon international than upon internal telegrams, when I fixed my attention upon the effect of tariffs. The subject has been considered only with the view of arriving at as many fixed points as possible, and in the course of my investigations I found that Belgium had already mastered this subject ; the greater part of my labour since obtaining the Belgian Report has, therefore, been to examine and compare the statistics of all other countries, as well as those of private companies, with the principles there advanced, and I am bound to state that, so far as my powers go, I cannot find any data to refute any of the deductions or principles given in that exhaustive Report.



Silver & Cos.

Gibraltar.

FIG. N° 1.

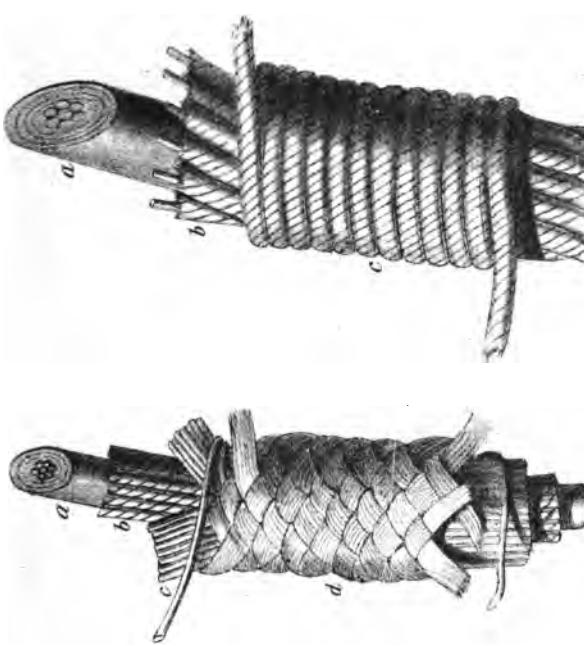


FIG. N° 2.

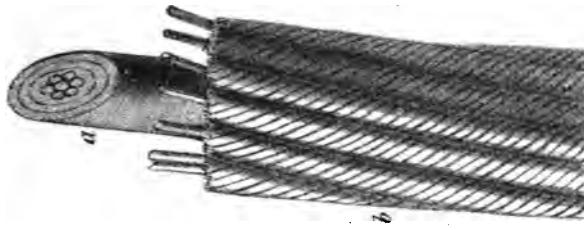


FIG. N° 3.

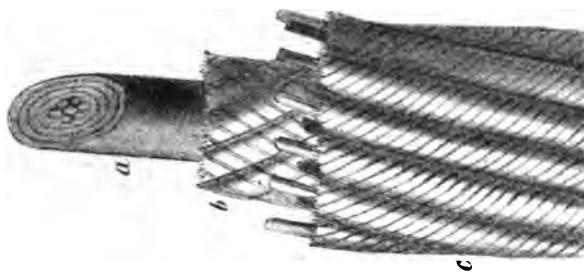
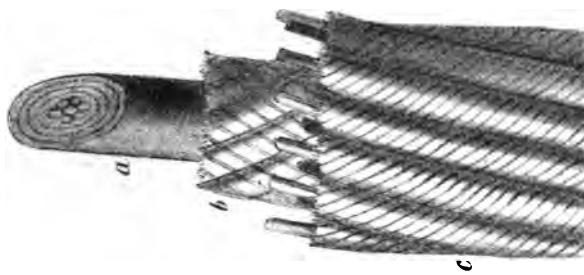


FIG. N° 4.



a Copper Wires, No. 16, covered with India Rubber.
b Tarred Yarns.
c Steel Wires.
d Plaited Hemp Covering.

a Gibraltar Core (see preceding figure).
b 9 Tarred Yarns about 8 gauge.
c Outside covering of 12 strands of Steel Wire and Hemp, each strand consisting of 1 No. 17 Wire, and 6 Yarns of Tarred Hemp.
c Serving of 1 Strong String.

a Gibraltar Core (see preceding figure).
b Covering consisting of 12 strands of Steel Wire and Hemp, each strand consisting of 1 No. 17 Wire, and 6 Yarns of Tarred Hemp.
c Outside covering of 12 strands of Steel Wire and Hemp, each strand consisting of 1 Wire, No. 14, with 6 Yarns of Tarred Hemp.

a Gibraltar Core (see preceding figure).
b Covering consisting of 12 strands of Steel Wire and Hemp, each strand consisting of 1 No. 17 Wire, and 6 Yarns of Tarred Hemp.

Allan's

FIG. N° 5.

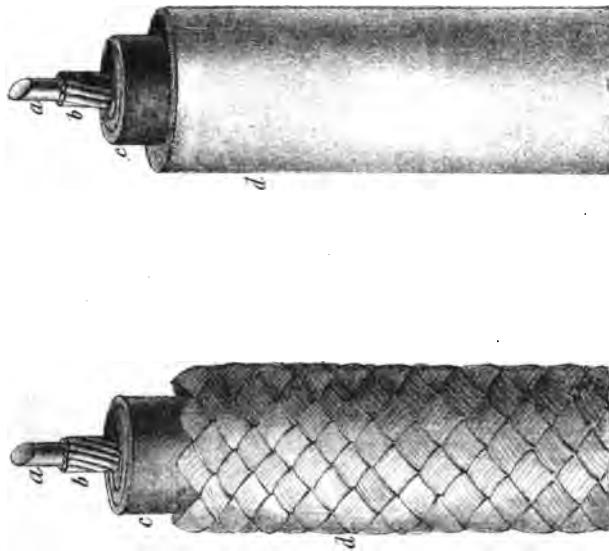


FIG. N° 6.

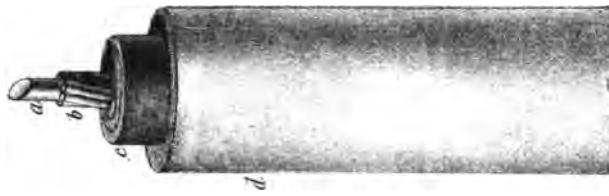


FIG. N° 7.



Godefroy's

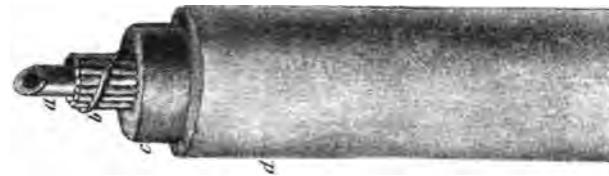


FIG. N° 8.

a Copper Wire, No. 10.
 b Steel Wires.
 c Three thicknesses of Gutta Percha.
 d Covering of Plaited Jute laid spirally.
 e Copper Wire, No. 10.
 f Steel Wires.
 g Three thicknesses of Gutta Percha.
 h Two coats of India Rubber Canvas.
 i Copper Wires, No. 23, covered with India Rubber.
 j Steel Wires.
 k Three thicknesses of Gutta Percha.
 l Two coats of India Rubber Canvas.
 m Patent Cocos Nut Fibre Compound.
 n India Rubber Canvas.

Godfrey's

Hall & Wells'

FIG. N° 9.

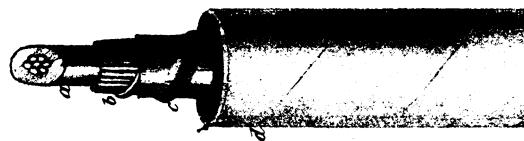


FIG. N° 10.

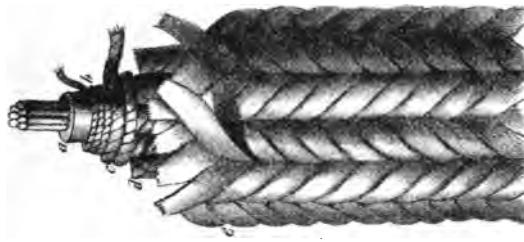
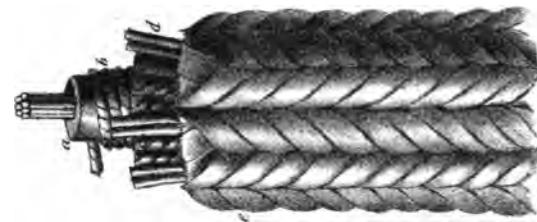


FIG. N° 11.



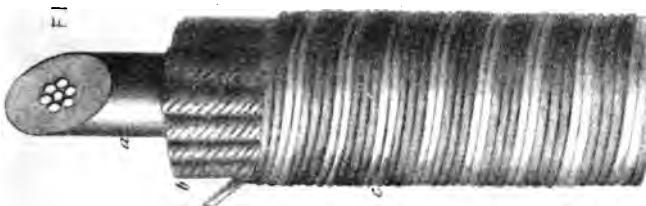
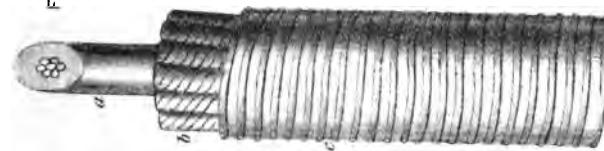
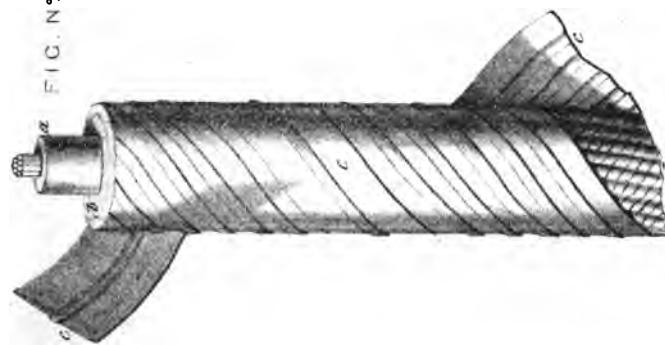
- a 7 Copper Wires, No. 22, covered with two coats Gutta Percha.
- b 22 Steel Wires with Canvas covering.
- c India Rubber Coating.
- d India Rubber Canvas.

- e 7 Copper Wires, No. 22, covered with Tape and insulated with 3 coatings of India Rubber (a) having between 2nd & 3rd coatings a layer of Vulcanized Thread covered with Cotton.
- f Serving of thin Hempen Twine.
- g 4 Tarred Yarns lapped spirally.
- h 12 longitudinal Hempen Yarns.
- i Sheath of Hemp Plaiting with 12 longitudinal strands.

- j Core of 7 Copper Wires, No. 22, covered with Tape, and insulated with 3 coatings of India Rubber (a) having between 2nd & 3rd coatings a layer of Vulcanized Thread covered with Cotton.
- k Serving of thin Hempen Twine.
- l 19 Tarred longitudinal Strands.
- m 8 longitudinal Steel Wires, No. 16.
- n Sheath of Hemp Plaiting.

Siemens'

Sinnock's



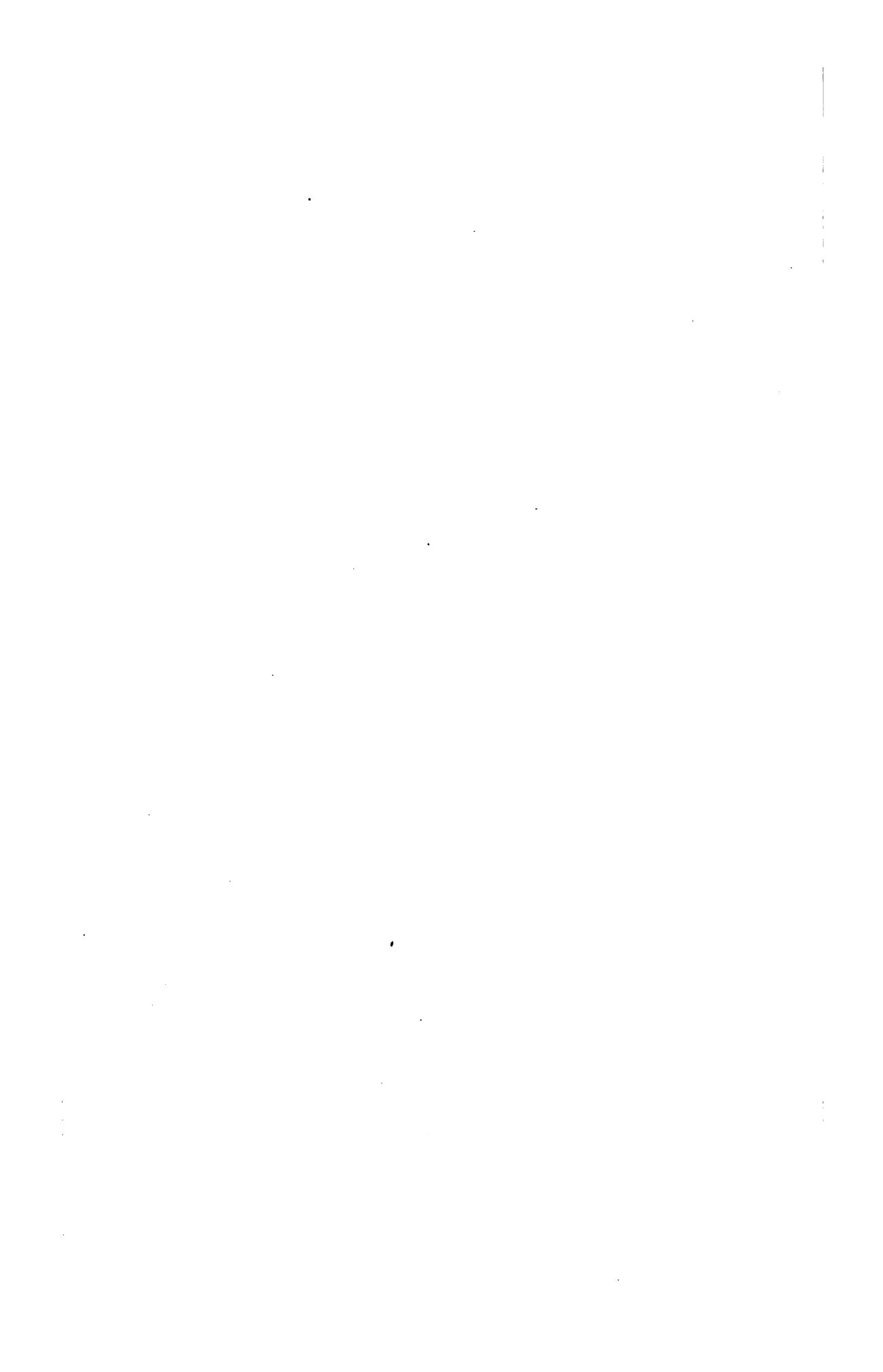
De Bergues'

FIG. N° 15.



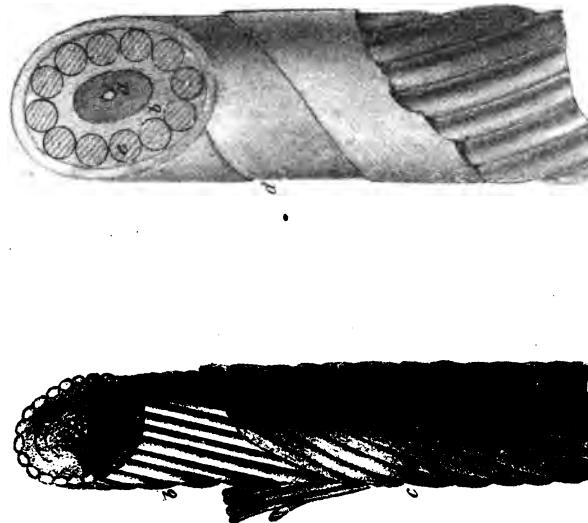
Core of 7 strands of Copper Wire covered with Gutta Percha.
 a Core of 7 strands of Copper Wire covered with Gutta Percha Insulator served with water proof Tape.
 b 17 Tarred longitudinal Hempen Lines.
 c Serving of Hemp.

Core of 7 Copper Wires.
 a Gutta Percha Insulator served with water proof Tape.
 b 11 Marlin line spirally served with Hempen String.
 c Spiral serving of alternate Iron Wires and Hempen String.



L. Clark's

FIG. N° 16.



Hearder's

FIG. N° 18.



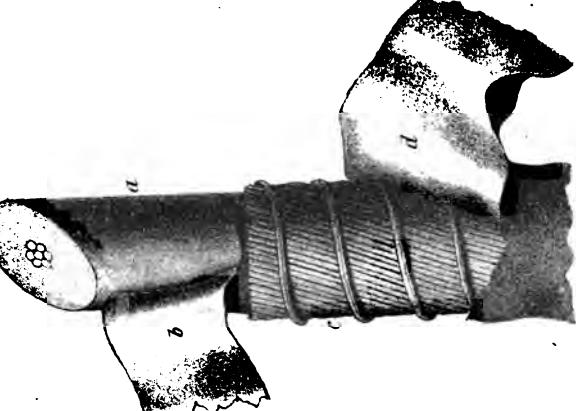
Gordon's

FIG. N° 19.



L. Clark's

FIG. N° 20.



a Core of 7 strands of Copper Wire. a Core covered with Gutta Percha.
b Steel Wires. b Serving of Tape and Hemp.
c Covering of Tarred Hempen Lines. c Gutta Percha.
d Covering of Canvas and Marine Glue.

a Copper Wires. a Copper Wire.
b Hempen Strands. b Steel Wires.
c Gutta Percha. c Gutta Percha.

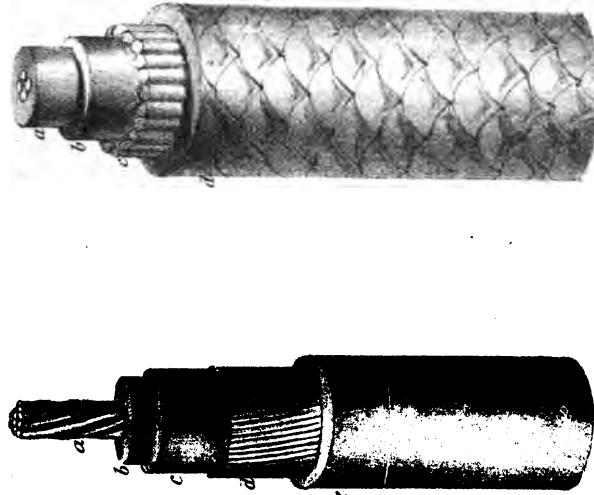
d Covering of Tape and a composition of Shellac and Marine Glue.



Hooper's

Red Sea
1860.

F I C. N° 21.



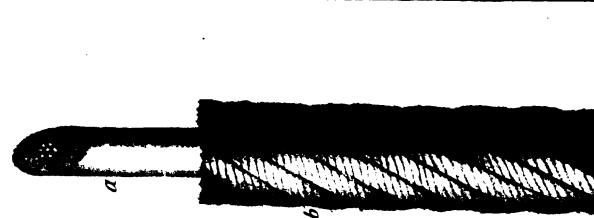
F I C. N° 21.

Atlantic
1858.

F I C. N° 23.

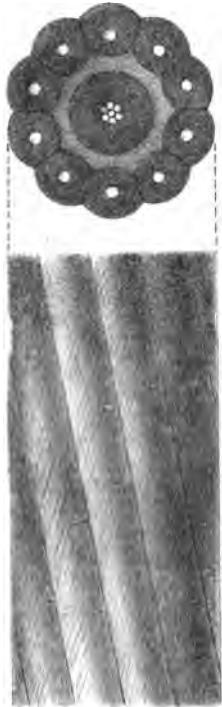
Dardanelles-Alexandria
Canal-Alexandria Section.

F I C. N° 25.

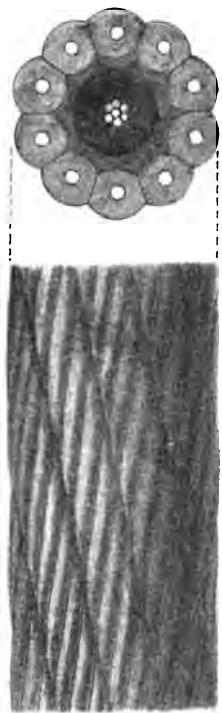


a Copper Wires.
 b India Rubber.
 c Vulcanized Rubber.
 d Steel Wires.
 e Outer covering of Vulcanized Rubber.
 f 7 Copper Wires, covered with Gutta Percha & Chatterton's Compound.
 g 18 Strands of Charcoal Iron.
 h Pliated Hemp Covering.
 i 7 Copper Wires, covered with Gutta Percha.
 j 18 Strands of Charcoal Iron.
 k Covering 8 Hempen Strands.

Atlantic Cable - 1865.
FIG. 26.



Atlantic Cable - 1866.
FIG. 27.



7 Strand Copper Wires embedded in Chatterton's Compound, covered with layers of Gutta Percha and Chatterton's Compound.
Outer Wires: Compound Hemp and Iron Wire.

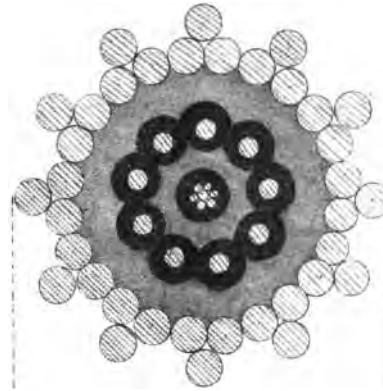
FIG. 28.



TYPE OF PRESENT SUCCESSFUL IRON-COVERED CABLE.
COATED WITH BITUMINOUS COMPOUND.



FIG. 29.



RED SEA, 1871, SHORE END.

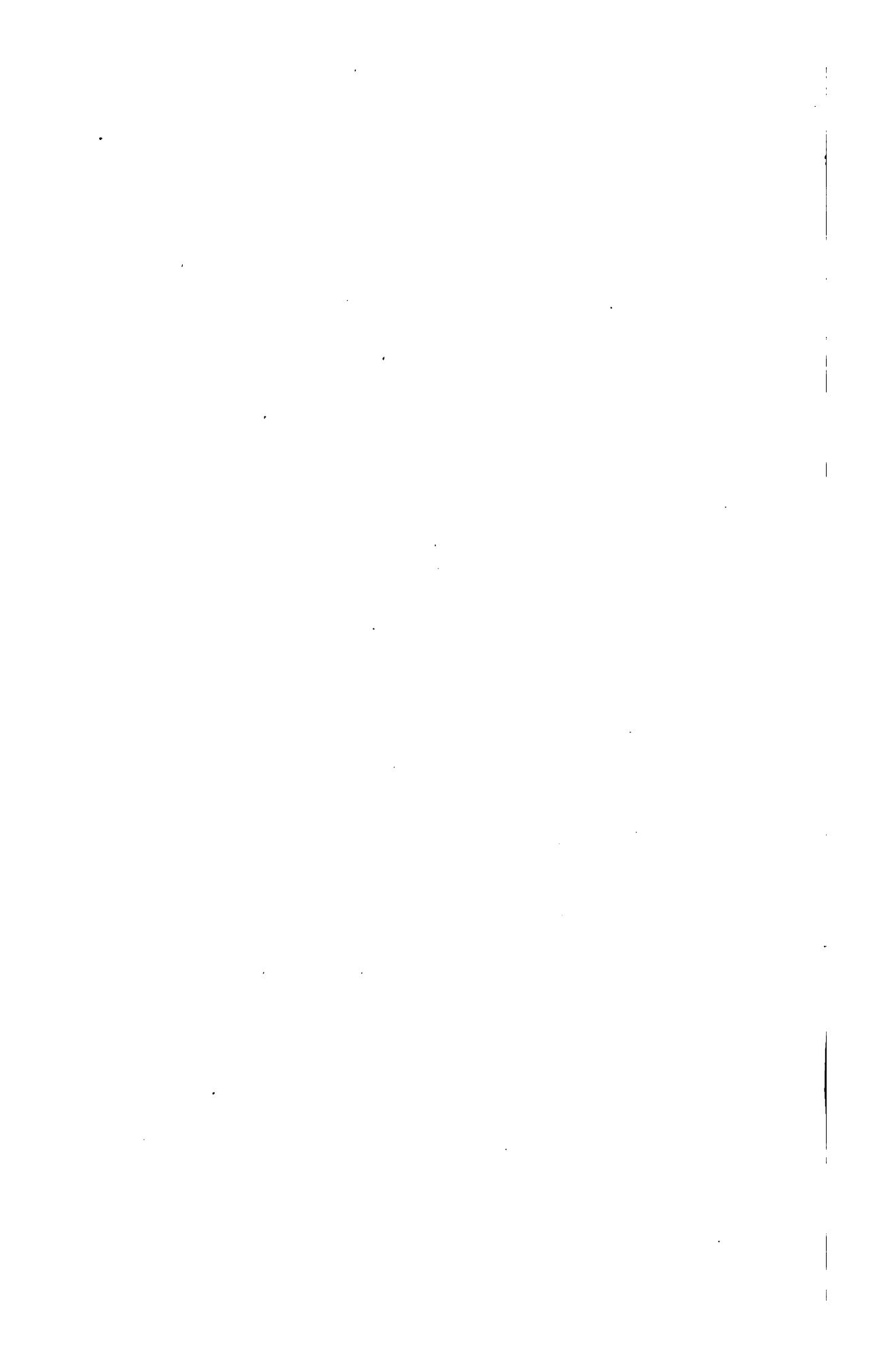
(BRITISH INDIAN.)

F I C. 30.

V a r r i e y S



a 4 Strand Copper Wire, covered with Gutta Percha and Tape.
b 2 Hempen Strands.



PART II.

SUBMARINE CABLES.

THE accompanying table contains as accurate a statement as I can obtain of all the submarine cables laid up to this date, and in the following remarks I state, what, in my opinion, this experience of twenty years has established.

This is by no means a new subject of investigation, but in the present day I am certain it will be instructive to many amongst the thousands who are now interested in this class of property, to have their attention briefly called to all that has been done to make submarine cables a sound property.

Eleven years ago there was a Joint Committee appointed by the "Lords of the Committee of Privy Council for Trade and Atlantic Telegraphy, to enquire into the construction of submarine cables, together with other evidence."

The report is dated April, 1861, and is signed by Douglas Galton, C. Wheatstone, W. Fairbairn, Geo. P. Bidder, Edwin Clark, Cromwell F. Varley, Latimer Clark, and George Saward, and they state that they had the benefit of the advice of the late Mr. Robert Stephenson.

They examined 40 witnesses, all eminent in their day, and numbering amongst them most of the names which are yet conspicuous in the engineering, manufacture, and submerging of this class of property.

Fifty cables had been laid at the date of this investigation, all upon the same general principle.

Eight thousand miles had been lost, all belonging to four undertakings, viz.: The Atlantic, Red Sea and India, Sardinia-Malta, Corfu-Malta, and Singapore to Batavia Cables.

They state that the loss of all these cables was "attributable to defined causes which might have been guarded against," and they believed there were no difficulties to be encountered which skill and prudence would not overcome."

The Committee considered it unreasonable to expect more rapid progress than had then been made, the first few cables laid in shallow water across the Channel were comparatively easy to recover and repair; they had been manufactured without much necessity for extreme care, and had been accepted as successful precedents; further investigation was considered unnecessary, and bold attempts were made to lay cables of a similar type under entirely different conditions, but "they considered it "doubtful whether the transmission of messages for even so "short a period as three weeks through a cable across the whole "width of the Atlantic was not a result worth all the expenditure "which had been incurred."

Attention is called in the report to the "remarkable fact that "in almost all cases small cables had been found liable to mishaps, "while the heavier the cable had been the greater had been its "durability."

At the date of this report, the types of cable illustrated on the preceding pages had been experimented upon, upwards of 1,300 tests had been made by Messrs. Siemens, Forde, and Gisborne for H.M. Government, with the object of discovering the best form of cable, and many hundreds of tests besides had been made by Messrs. Glass Elliot, Messrs. Newall, Messrs. Siemens, Messrs. Silver, and many others with the same object. At this date 1859 to 1861, there were ample data for investigation, and there were many eminent and practical men of experience in this class of enterprise; we are not therefore disappointed in the result of the enquiry. The report is full and complete, and *established principles which up to the present time have uniformly guaranteed success, while the neglect of them has as uniformly resulted in partial loss or failure.*

LOSS OF CABLES.

The loss of cables was found to be attributable to the following causes :—

A. First, and the most important of all, from *imperfect manufacture*, resulting without doubt prior to this date from inexperience of the materials for insulating the copper wire, and from ignorance of the fact discovered by Professor Thomson about 1856, viz., that some kinds of copper wire were no better than iron for the purpose of conductivity, and that it required carefully selected copper to give the desired standard, which may be represented by a copper wire one-tenth of an inch in diameter, being equal to an iron wire one-third of an inch in diameter, for electrical purposes.

All cables manufactured previous to this date had no advantage from this discovery.

There appear to have been mechanical difficulties in keeping the copper conductor in the centre of the insulating medium, so that the copper was sometimes found to be almost visible under the light film of gutta percha which covered it. The electric current soon weakened this film, stronger currents were used to overcome the weakness of the signals, and the cable was soon destroyed. Experience about this time had established that

A cable from the commencement of its manufacture to the time of its being laid should be tested under water and under pressure, and kept as much as possible under all the conditions in which it was meant to continue.

Sir S. Canning taught that the “*great secret was to keep a cable quiet from the time it was made until it was laid,*” and no one disputed the fact that *every time a cable is coiled or uncoiled it sustains more or less injury.*

B. Attempts to lay cables from sailing ships towed by steamers was another source of failure. The ships had not enough steerage way when met by strong head winds, and too

much slack was paid out. It was difficult under such circumstances to steer a straight course, and sailing ships possessed no power of being readily stopped when a fault or accident occurred.

C. Many accidents happened from inexperience in the method of paying out cables ; at the present day the wonder is that they should have succeeded so well with the rude methods and inexperience which then existed, and not that there should have been many failures and much recrimination. Reading the history of these first attempts to place a network of cables at the bottom of the ocean fifteen and twenty years ago, is a good deal like reading the old stories of the early voyages of discovery. There are difficulties and disasters peculiar to every attempt, and the grand result is that one way or another they were overcome, or else they suggested such modifications that their recurrence was avoided, and an accident to a well-manufactured cable no longer constitutes a loss.

We read of the vessel paying out the Toulon-Algiers cable being run into by the French ship sent to assist her, and the cable, although buoyed, was lost.

Another attempt failed "from a fracture due to the occurrence of a storm."

They were five days in laying the Corsican cable, a distance of only 70 miles. "They used to anchor at night holding on to the cable waiting for daybreak."

The first attempt to lay the Sardinia-Bona cable failed from the cable breaking while trying to recover it by "*heaving it in with the windlass.*"

In the second attempt they ran short of cable ; the vessel sent to guide led them out of their course. When day broke the ship which was leading was dressed with flags ready to land the cable with startling *éclat*, but they were steaming in the wrong direction, and there was not cable enough on board to allow for the error which had been committed. "The ship held on to it for four or five days, sent another steamer to bring assistance ; rough weather came on, and the cable broke in 400 fathoms."

The third attempt failed, "owing to imperfect manufacture."

The first Atlantic cable failed principally on account of imperfect manufacture, in a great measure arising from undue haste and urgency, but largely owing to insufficient experience.

The cable was not tested under water for fear of rusting the small steel wires of the external covering, and small wires have never since been used; large wires, the larger the better, is now a principle.

The copper was not all good.

It had often been coiled and uncoiled, and had been exposed to the strong heat of the sun and to many changes of temperature.

Any of these conditions would now-a-days be regarded as enough to condemn the most carefully manufactured cable.

The Red Sea and Indian cables are said to have been imperfectly manufactured and laid too taut, but *they were not tested under water from the time of manufacture until they were placed at the bottom of the sea*, and this one grand omission, largely due to inexperience, is enough without the recriminatory points to condemn to loss and failure any cable whatever.

The cables laid from Cagliari to Malta and Malta to Corfu are said to have failed from imperfect manufacture. One experienced gentleman in his evidence said these cables were "such as nobody should have laid in deep water." It is sufficient at present to know that they failed from neglect or inexperience, and that they, amongst other failures, have established the principles which have since ensured success.

D. The want of constant supervision by engineers, exclusively in the interests of the purchasers of the cable, has been a great cause of defective cables.

There may often be minute defects in the core itself, or a slightly defective splice which may reduce the electrical condition of a comparatively short length; this may easily be raised above the average standard required by the contract, by the next length being more carefully manufactured.

These minute defects must, however, kill the cable in more or less time, and the principle is established that

Every inch should be tested in course of manufacture, and rejected if there is any irregularity of condition to cause suspicion.

There should be constant supervision, and a record of all the tests kept for the purchasers of the cable, from the commencement of the contract to its final completion, and continued ever afterwards by the purchasers.

CAUSES OF INJURY TO CABLES.

The principle sources of injury to cables are: 1st, moving water, either currents or tides, chafing the cable upon rocks or shingle. Experience has given many costly lessons of the effect of moving water.

Ten years ago it was generally believed that water had very little motion below fifty fathoms, and one hundred fathoms was considered a point of great safety. We now know that there are exceptional localities where there is motion in the water at a depth of five hundred fathoms. The Falmouth cable was chafed and destroyed at this depth from this cause.

The Channel Islands cable was also destroyed from the same cause.

The first cable ever manufactured with due regard to the principle of careful supervision, testing under water, and being retained quietly in that condition until it was laid, was the Malta and Alexandria Cable laid in 1861.

This cable was submerged in too shallow water, for many miles in less depth than twenty fathoms; the result was the frequent recurrence of fracture from being rolled about by the surf, and yet this cable was only finally abandoned last year; not because it could not be kept in repair, but because it cost too much to keep it in order.

These and many other examples have established the principle that

No cable should be laid without first obtaining an accurate survey of the approach to the coast and landing places with accurate soundings over the intended route, and as much knowledge as possible of the nature of the bottom.

Currents and anchorage should be avoided, and where that is impossible the heaviest cable that can be laid should be provided.

Heavy cables should be laid out to depths of four hundred fathoms where there are tide-ways.

Where a current exists a position should be sought for as far removed from it as possible.

A great cause of injury to cables is the corrosion of the external wires caused by moving water or marine vegetation, &c., and this has established the general practice of covering the external wires with tarred yarn saturated with a mixture of pitch and silica. There is still great room for improvement upon the present method of protecting the external covering of cables, and I commend it to the further careful study of telegraph engineers as a subject of vital importance.

Another enemy of submarine cables is the toredo of all kinds; there is one kind which has proved destructive by boring through the core, but that has only occurred in shallow water; there is another kind which destroys the hemp in a few months, and is then satisfied to fix itself upon the gutta-percha and remain there. *Cables have been recovered from depths of twelve hundred fathoms with all the hemp eaten away, and the core pitted with these marine animals. The recovery is then only possible by the strength of the external wires.*

All the experience we have points to the value of protection, first, of the core, then of the external covering, and if those responsible for the safety and maintenance of submarine cables could be allowed to dictate the most desirable conditions of safety they would select, besides the strongest possible cable to be manufactured and laid with extreme care, a depth of water about five hundred fathoms, and a bottom of sand or mud; but as this cannot always be secured, nothing should be omitted in the direction of strength and quality.

Lightning is still another source of injury to cables, this is however, so readily guarded against that we no longer hear of injury from this cause; it is said to have destroyed three cables. Mr. Siemens produced before the Committee a piece of the core of the Corfu cable injured by lightning; the land line had been struck, and from the absence of any lightning guards, the cable was damaged.

Mr. Preece described the Jersey cable to have been destroyed by lightning.

Mr. Fleeming Jenkin had seen a fault eighteen inches long due to this cause, and it is asserted that the same cause destroyed the Toulon-Algiers cable, which was connected to the land lines without lightning guards.

**INJURY FROM ACCIDENTS AND OTHER CAUSES
DURING THE PROCESS OF SUBMERGING.**

The most frequent injury arises from the wire with which the cable is covered, being too brittle or parting at the scarf joints, and at once becoming little poignards, liable to pierce the core during the process of laying. The necessity for laying the cable at a moderate speed and with great care, prolongs the voyage across a broad ocean for many days and nights, and it is not surprising that these broken wires should at times pierce the core and necessitate the instant hauling back of the cable, no matter what the depth of water, or what the condition of weather may be, and this establishes the principle :—

That all cables should be made with due regard to the depth of water in which they are to be laid, and strong enough to admit of being recovered in case of accident, which may as probably occur during a tempest as during a calm.

But accidents from this cause seldom or never occur (I do not know of a single instance) when the external wires are covered with yarn and bituminous compound ; this covering has therefore the double value of protecting the external wires, and adding greatly to the safety while laying.

There are, besides, accidents liable to occur at sea which no human foresight can guard against ; over a period of ten or twelve days, more or less bad weather is almost certain to occur, and should at all events be provided for by a margin of strength.

What are called foul-flakes and kinks, and accidents to machinery and to the men have occurred, and may occur again, requiring the ship to be suddenly stopped, and great strain to be thrown upon the cable, and it is sometimes necessary to cut and buoy, and leave it for several days.

That accidents need not occur often, and might not occur at all, at times, is not sufficient argument to justify a cable being made unequal to an emergency.

LIGHT CABLES.

We are every now and then startled by the announcement that light cables are to be preferred to the present iron-clad type, and the object of this investigation has been to discover what data there are to justify any preference to one form of cable over another.

I have said already that the Committee called attention to the remarkable fact that, in almost all cases, small cables had been found liable to mishaps, while the heavier the cable the greater had been its durability.

Mr. Newall, in his evidence, said that the hemp covered cable which he attempted to lay in 1859, between Candia and Egypt, had the hemp eaten off by the toredo in a very short time, and it was too weak to recover for repairing.

The same firm laid an unprotected core from Varna to the Crimea, and it lasted until the winter set in ; it is frequently said that it was cut by order of the French Commander-in-chief, but there is no proof of this, and I am not disposed to believe it. Mr. Woodhouse, the engineer, who laid this core, said in his evidence "*he should not advise anybody to lay so light a cable across the Atlantic, because so small a strain would break it. If it is once safe at the bottom perhaps it may rest.*

Mr. Newall said he thought it folly to lay anything excepting unprotected core. Consistently with this conviction he laid in 1869 several lines of unprotected India-rubber core, connecting the Grecian Islands with the main land ; they were protected only near the shore.

The sea is quiet and tideless in those parts ; no better spot could be wished for the experiment, *yet all of them gave out within two years.*

The Red Sea Cable, covered externally with light wires, and unprotected with bituminous compound, was so rusted in a short time that it could not be lifted for repairs.

Notwithstanding Mr. Newall's partiality for light cables, he suggests at the close of his evidence what I assume he would consider the most perfect form of cable. He would cover the copper with india-rubber, protect this core with steel wires, vulcanised, the whole then passed through heat; thus insulating all the wires, he would make the cable in one length, and have no joints.

Mr. Lionel Gisborne considered a hemp-covered cable "perfectly useless for laying in water; it has both the liability to stretch and to shrink."

Mr. Fleeming Jenkin, in his report to the International Exhibition of 1862, says:—

"So long as the iron wires lasted, the cables frequently continued to work in spite of faults, but sooner or later the iron wires of all these light cables rusted away in parts; so soon as this took place they one and all broke up into short sections; this fact has been observed in depths of one hundred fathoms" the reasons were not obvious to Mr. Jenkin, but he says, "*meanwhile the use of large iron wire seems a sure guarantee against this danger, for as yet no cable covered with wire of the large gauges has ever parted in the manner described.*"

"The difficulty is to find a permanent material which shall retain its strength and continue to afford protection after the cable is laid."

Every word of this can be written at the present moment, that is, ten years later, with exactly the same significance.

All cables which have been manufactured and laid upon the principles which were established in 1859, are yet in good working order, and every divergence from these principles has been at best a costly experiment or utter failure.

It is urged as a strong reason in favour of unprotected core (light cable) that there are many miles of cables now in existence from which the outer covering has fallen off by decay or otherwise; but I am not of that opinion, and it can only be an opinion. In many cases, perhaps in all, the outer covering may have lost much of its strength, but it is more likely to have the merit of keeping the core protected and undisturbed, owing to its weight

and accumulation of deposit upon it, than to have fallen off and left the core unprotected.

I am of opinion that whenever the outer covering falls off, the life of the cable will be very short; and I am prepared to expect that in many of the cables now laid all the shallow water parts will have to be renewed from time to time.

There is no instance yet of a well-manufactured heavy cable breaking or giving out in deep water, where currents have been avoided, after it has been carefully laid free from defects, but there may be much due to the external covering keeping it quiet, there has assuredly been a great deal due to the external covering in the successful submerging, and there is no experience whatever to justify the assumption that an unprotected core would last, even if laid.

It has been urged that an iron-covered cable suspended from one point to another gradually becomes weaker, that rust and marine growth or deposit accumulate and break the cable with their weight; but I do not know of any instance in support of this assumption, nor is it at all certain that a simple unprotected core would exist for any length of time, or be in any way better adapted for the supposed conditions.

Mr. Latimer Clark in his evidence says:—"You want a certain degree of weight to enable your cable to sink steadily to the bottom, especially when it has to fall into hollows and cavities, and not lay loosely across elevations."

Again, it is urged that experiments with light cables have been tried in factories or sheds, and the result proves that there are many advantages in their favour; but I am of opinion that no experiments which can be made on shore will sufficiently resemble the exigencies which may occur over a period of several days and nights at sea in storms and darkness, and still less will they prove their fitness for the unknown conditions which may exist at great ocean depths.

I desire to write with great respect for the opinions of the talented men who urge the adoption of light cables; it is my special duty to weigh well and without prejudice all they have to advance, but I think a careful investigation into the expe-

rience and practice of the last twenty years establishes conclusively that all light cables have been short-lived, and that all heavy cables have continued working, often under most adverse conditions.

It is my own opinion, and I am authorised to say, that it is also the opinion of my friend Captain Halpin, who has laid all the cables from Suez to Australia, besides the French Atlantic Cable (eleven thousand miles) and has also recovered and repaired cables from a great variety of depths—that a cable should be as heavy as it can be laid with safety and admit of being recovered in case of accident. *Multiply every precaution which shall increase the strength and keep that strength intact as long as possible.*

The best form of light cable I have seen is the copper-covered core invented by Mr. Siemens (fig. 12 page 58). I should have anticipated that if any light cable could have been successful, this one would have met all the conditions, excepting that of extreme cheapness, but it has not been so uniformly successful as the heavy iron-clad cables.

The very light cable invented by Mr. Varley (fig. 30 page 62) admits of being laid by having the strain taken off the core by the two hempen strands, the core itself being the third strand of the cable. As a light cable to be manufactured in a great hurry and laid to meet some emergency, it has a good deal of merit, but for a deep sea cable, I am of opinion, that it would be found too incomplete and unfinished, and that difficulties would be experienced in laying, which are not at once foreseen, and there would be no durability even if successfully laid.

Every day of my experience in watching over the permanence of the ten thousand miles of cable under my care, confirms me in the opinion that too great caution and vigilance cannot be exercised in making and laying a thread which is to be removed from all human vision for ever, and designed to earn dividends by continuing a perfect conductor of electricity.

Upwards of thirty thousand miles of cable have been laid since the report of the Committee was printed eleven years ago, and much experience has been gained of the exigencies incidental

to submerging, buoying, grappling, and repairing ; but no fact has resulted from all that experience which has established that any one precaution recommended in the report has been superfluous, whereas much has occurred, which I will not particularise, proving that any attempt to disregard any single precaution has resulted in great pecuniary loss or utter failure.

We have many reasons to confirm the belief that a submarine cable, manufactured and laid with strict attention to all known principles, may be regarded as a substantial property, likely to last for any length of time ; for there is no evidence whatever upon record which shows any decay of the insulating medium or copper conductor of a well-manufactured cable, *i.e.*, "*there is no decay inherent in the nature of a cable, all deterioration is external;*" nor is there any experience whatever to establish that this insulated copper wire will enjoy any durability if unprotected with an external covering.

A light cable or unprotected core must therefore be regarded at best as an experiment, with the chances against the successful laying, and still more against its existing as a permanent property.

I have written enough to illustrate that the present submarine cable (fig. 28 page 61) is not a haphazard idea, but one which has grown out of many failures and thousands of experiments ; all the principles of manufacture and laying down have been established by great anxiety and reflection on the part of the able men who gave their energies to this kind of enterprise prior to 1865. We who have come upon the stage since that date, have only discovered that we may not neglect one of all the known principles, but if possible elaborate every one of them, and even then the duty and responsibility of laying and maintaining this class of property, has enough of risks and anxieties to make one heartily dislike any experiment which can only be advocated for the sake of cheapness in the first cost. *I believe this economy would be at the expense of security, and that the cable of the future will be even heavier, more perfect, and more costly than the cable of the present day.*

LIST OF

Date.	From	To	Length in miles.	Weight per mile in tons.	Greatest depth in fathoms.
1850	*Dover	Calais	25	0·2	30
1851	Dover	Calais	25	6·0	30
1852	Keyhaven	Hurst Castle	3	..	20
,"	*Holyhead	Howth	65	1·57	83
,"	*Port Patrick	Donaghadee	15	..	160
,"	*Port Patrick	Donaghadee .....	..	..	149
,"	*Prince Edward Island .....	....	12	..	18
1853	Denmark, across Belt	....	18	4	15
,"	River Tay .....	....	2	..	..
,"	Dover	Ostend	76	5·75	30
,"	Firth of Forth .....	....	5	1·75	7
,"	Port Patrick	Donaghadee	25	6	160
,"	*England	Holland	115	1·75	23
1854	Port Patrick	Whitehead	27	6	150
,"	Sweden	Denmark	12	6	14
,"	*Corsica	Sardinia	10	8	20
,"	*England	Holland	120	1·75	30
,"	*Holyhead	Howth	65	2	80
,"	*Spezzia	Corsica	110	8	325
,"	Holyhead	Howth	65	2	83
1855	*Sardinia	Africa	50	8	800
,"	*Cape Ray	Cape North	74	2·2	360
,"	*Sardinia	Africa	160	3·7	1,500
,"	*Varna	Balaclava	310	2½cwt.	300
,"	*Eupatoria	Balaclava	60	0·75tms	69
,"	*Varna	Kilia	179	..	30
,"	Egypt .....	....	10	5·25	..
,"	*Italy	Sicily	5	5·25	27
,"	*England	Holland	123	..	23

* Not working February, 1872.

SUBMARINE CABLES.

REMARKS.

Worked one day only—proved Submarine Telegraphy practicable. Gutta Percha covered wire weighted every $\frac{1}{8}$ mile with leaden weights.

The first iron covered Cable—Now universally used—Has had several lengths of new Cable inserted.

The first application of pure India Rubber to Submarine Cables, outside wires plaited together. The Cable lays in mud greater part of its length.

No hemp serving. Worked four days only.

Laid within seven miles of coast when bad weather came on and Cable cut and abandoned; afterwards recovered and completed.

Hemp-covered Cable.

Centre wire never worked.

Four Cables galvanized and laid up together.

Light Cable.

Galvanized.

One wire failed in 1862.

For eight years this Cable remained perfect.

This, and three other similar Cables laid at different times, so frequently broken by anchors, have been picked up and laid up into one Cable between Belfast and Scotland.

Failed in consequence of iron wires rusting after five years, so as to prevent picking up.

Broke down in 1864. Cable worked without single interruption for ten years, until it finally failed.

Paid out from sailing ship. Ship badly steered, Cable ran too short. Part of the Cable subsequently laid between Newhaven and Dieppe.

Paid out from sailing ship. Bad weather, Cable cut. Greater part recovered.

Cable run short of distance. Ship hung to Cable five days and five nights, when Cable parted.

Gutta Percha wire only. Shore ends of Holyhead and Howth Cable in this list. Worked eleven months.

Too light for shallow water. Length manufactured was too short. Part of another Cable taken to make up length. Was improperly joined to land lines at Kilia. Lightning frequent there.

LIST OF SUBMARINE

Date.	From	To	Length in miles.	Weight per mile in tons.	Greatest depth in fathoms.
1855	*England	Holland	119	..	23
1856	*Cape Ray	Cape North	85	2.5	300
"	Prince Edward Island .....	....	12	2.5	14
"	Across Gulph of Can so	....	1½	2.2	..
"	*Crete	Alexandria	350	..	1,350
"	*Crete	Syra	170	..	1020
"	St. Petersburg	Cronstadt	10	..	10
"	Bosphorus .....	....	1	..	40
"	Across Amazon ....	....	105	..	..
1857	*Sardinia	Bona	150	1.85	1500
"	*Sardinia	Malta	500	0.9	1000
"	*Corfu	Malta	500	0.9	1000
"	*Portland	Alderney	69	2.5	60
"	*Alderney	Guernsey	17	2.5	44
"	*Guernsey	Jersey	15	2.5	60
"	Norway Fiords ....	....	49	2.75	300
"	Ceylon	Mainland	30	2.75	45
"	Danube .....	....	3	1.75	..
"	Ceylon	Mainland	30	2.75	40
1858	*Italy	Sicily	8	5.25	40
"	England	Holland	129	9.75	27
"	*Cromer	Emden	280	3	28
"	Norway Fiords ....	....	16	2.75	300
"	*Atlantic .....	....	2036	1	2400
"	*Dardanellos	Khios			
"	*Khios	Syra			
"	*Syra	Athens	565	0.94	1100
"	*Khios	Smyrna			
1859	*Crete	Alexandria	159	..	1600

* Not working February, 1872.

CABLES—*continued.*

REMARKS.
First Strand Conductor. Cable has been broken by anchors.
Part of first Cape Ray Cable recovered by Captain Field.
Third attempt—part of Cable remaining from second attempt—remainder Red Sea Cable.
Strands. Iron wires quite rusted off in places. Eighty miles recovered. Doubtful whether more than two wires ever worked.
Red Sea form of Cable. Cause of failure not known. Broke on Adventure Bank. End taken from there and laid near Marsala. Worked short time only.
Red Sea form of Cable. Cause of failure not known. Broke in deep water about eight miles from Corfu.
Placed across a rapid tideway. Too light for position. Repaired eleven times and then abandoned.
Very rocky landing places.
Very rocky landing places.
During laying malicious injury to one wire, afterwards repaired. Two of the four insulated wires had Chatterton's compound between the layers of Gutta Percha. This compound has been used in almost all subsequent Cables.
Eighteen strands of seven wires. Worked nearly one month. Very defective before it was laid, outer covering soon rusted. Unsuccessful attempt to lay in 1857.
These lines were continually repaired and then abandoned. Similar to Red Sea Cable.
Hempen Cable. Insulation failed. Cable cut and abandoned.

LIST OF SUBMARINE

Date.	From	To	Length in miles.	Weight per mile in tons.	Greatest depth in fathoms.
1859	*Crete	Alexandria .....	..	0.9	1350
"	*Singapore	Batavia	630	0.94	20
"	Denmark	Heligoland	46	4	23
"	*Cromer	Heligoland	328	4	30
"	Isle of Man	Whitehaven	36	2.5	30
"	Sweden	Gottland	64	2.5	70
"	Folkestone	Boulogne	24	9.5	30
"	India Rivers .....	....	10	4.5	..
"	Malta	Sicily	60	3.25	75
"	Jersey	Pirou	21	3.75	10
"	*Otranto	Avlona	50	0.9	400
"	*Centa	Algeciras	25	1	700
"	Alexandria .....	....	2	..	..
"	Lynas	Great Ormes Head	19	3.1	14
"	Ayr	Mimbre Island			
"	*Cape Otway	King's Island			
"	*King's Island	Humamuck Island	240	2	60
"	*Humamuck Island	Circular Head			
1860	Great Belt .....	....	14	8	18
"	Great Belt .....	....	14	5.5	18
"	*Dacca	Pegu	116	0.9	60
"	*Port Vendres	Algiers	520	1.14	1,585
1859 and 1860	*Suez	Cassire	255		
	*Suakin	Cassire	474		
"	*Suakin	Aden	627		
"	*Aden	Hellania	718		
"	*Hellania	Muscat	486		
"	*Muscat	Kurwacheo	481		
"	*Barcelona	Mahon	198	1.25	1,400
"	*Minorca	Majorca	35	1.9	250
"	Iviza	Majorca	74	1.9	500
"	*St. Antonio	Iviza	76	1.9	450

* Not working February, 1872.

CABLES—*continued.*

REMARKS.
Hempen Cable (remainder of former), covered iron. Also failed in laying.
Too light. Repeatedly broken by anchors and currents, or maliciously by natives, and repaired.
Covered. Bright and Clark's patent covering by heat.
Two slight repairs within one mile of shore.
Old Atlantic Cable covered.
Old Atlantic never worked.
Laid in a bad direction, continually chafed by rocks—the points of landing unnecessarily numerous, being six instead of two, and those places very badly chosen.
Steel wires covered hemp. This form of cable is the type of the Atlantic cables. The hemp was eaten away by shellfish, even in 1,000 fathoms and upwards. The first cable in which the specific gravity was diminished by hemp spun round each separate wire of the sheathing. Repaired in 1861: repairs attempted and abandoned in 1863. Line supposed to have failed through lightning.
Red Sea Telegraph. Some of these sections worked eighteen months or two years. Line laid too taut—iron wires too slight, soon rusted. The <i>entire</i> line from Suez to Kurrachee only worked through the whole distance for a few hours. <i>Not</i> tested under water before laying.
Balearic Islands Cable. One of these sections never worked well.

LIST OF SUBMARINE

Date.	From	To	Length in miles.	Weight per mile in tons.	Greatest depth in fathoms.
1861	Corfu	Otranto .....	..	3·4	1,000
	" *Malta	Tripoli	230	2·5	385
	" *Tripoli	Bengazi	508	1·85	420
	" *Bengazi	Alexandria	593	4·5 6·0	80
	" Norway Fiords....	....	..	2·75	300
	" Dieppe	Newhaven	80	8	25
	" *Toulon	Corsica	195	1·14	1,550
1862	Wexford	Abermam	63	5·25	50
	" Lowestoft	Zandvoort	125	9	27
	" Across Cork Harbour	....	..	0·6	..
	" Across Blackwater	....	..	1·75	..
	" Greencastle	Cape Clear .....	..	..	..
	" Bristol Channel....	....	..	3·5	26
1863	*Cagliari	Sicily	211	1·8	1,025
1864	*Cartagena	Oran	130	..	1,420
"	Gwadur	Elphinstone Inlet ..	357	4·3	437
"	Mussendom	Bushire	393		97
"	Bushire	Fao	154		19
"	Gwadur	Kurrachee	246		670
"	Otranto	Avlona	50	4	347
1865	Indian Rivers .....	....	..	..	..
"	Sylt	Tondern	6	..	..
"	*Bona	Sicily	270	..	250
"	Trelleborg	Rugen	55	8	80
"	South Foreland....	Cape Grisney	25	..	30
1866	Atlantic .....	....	1,896	1·75	2,424
	Atlantic .....	....	1,852	1·5	2,424
	Lyall's Bay	White's Bay	41	9·1	50
	Crimea	Circassia	40	..	..

* Not working February, 1872.

CABLES—*continued.*

REMARKS.
In laying, run short of cable. Lost and recovered the end in 450 fathoms. The line was completed by using part of Port Vendres-Algiers cable. Repaired once in Otranto, shore end—twice on Corfu side; once a total break in the Light Cable, and the other break of conductor inside gutta-percha. Now working well.
Malta and Alexandria Telegraph. Has required repeated repairs on all three sections. The first cable tested under water. Was laid in too shallow water. Two of the faults have been in sixty-five fathoms, all the others have been in from thirty-five to fifteen fathoms. It was the first long cable which proved successful. It was the first cable properly tested—quantitation superseding empirical tests—and was the first cable sent out under water. It has been finally abandoned in the present year 1872, entirely owing to the frequent breakages in shallow water.
Part of the cable saved from Sardinia and Africa.
Steel wire hemp covered.
Outer wires protected by hemp and bitumen.
Protected by hemp and bitumen.
This Cable could yet be repaired, but the tariff is too low to induce any private Company to incur the expense of repairs and working.
Covered strips Muntz-Metal, applied helically. Was coiled on horizontal drum driven by machinery, and failed in laying.
Segmental conductor. Outer wires protected by bitumenized hemp.
Repaired once.
Hooper's core.
Repaired several times, and could yet be repaired. Tariff too low to induce any private Company to incur the expense of repairs and working.
Failed in a few days.
Twelve hundred and thirty knots laid in 1865. Completed August, 1866.
Hemp on steel wires. Has been broken several times near the shore and repaired.
One wire never good.

LIST OF SUBMARINE

Date.	From	To	Length in miles.	Weight per mile in tons.	Greates depth in fathoms.
1866	Colonia	Buenos Ayres	30	12	4
"	England	Hanover	224	10.9	27
"	Cape Ray	Aspee Bay	91	..	200
"	Leghorn	Corsica	65	..	100
"	Persian Gulf	{ Additional Cable, to connect Jask }	160	..	110
"	*Khios	Crete	200	..	1,200
1867	South Foreland....	La Panne	47	9.7	28
"	Ceylon.....	....	..	..	10
"	Malta	Alexandria	925	1.5	2,000
"	Havana, Cuba	Key West.....	125	2.5	20
"	Key West	Punta Russa.....	120	2.5	20
"	Placentia	St. Pierre	112	2.5	76
"	St. Pierre	Sydney	188	2.5	250
"	Arendal	Hirtshalts.....	66	..	110
1868	Messina Straits....	....	5	6.0	40
"	Havanna.....	Key West.....	125	..	..
1869	Peterhead	Egursand	250	3	70
"	Griesselhamn	Nystadt	96	3	47
"	Newbiggin.....	Sondervig	334	..	48
"	*Black Sea .....	....	300	..	..
"	*Scilly Isles	Lands End	27	6.0	40
"	Malta	Sicily.....	54	1.5	75
"	Tasmania	Australia	176	2.0	..
"	Scilly Isles	Land's End	27	3	42
"	*Corfu	Sta. Maura	50	..	160
"	*Sta. Maura.....	Ithaca	7	..	180
"	Ithaca	Cephalonia	7	..	..
"	*Cephalonia	Zante.....	10	..	60
"	Bushire	Jask	505	4.3	97
"	Brest	St. Pierre	2584	1.6	2760
"	St. Pierre	Duxbury	749	2.8	259

* Not working February, 1872.

CABLES—*continued.*

REMARKS.
Protected asphalted hemp.
Solid conductor.
Hooper's core.
Strand—No. 14 gauge.
Previous to 1868 several cables laid across these Straits failed through very strong current. A strong Cable, consisting of three single wire cables laid up into one, was then laid, and is in perfect working order yet.
Hooper's Core.
Strand Outer wires covered Bright and Clark's compound.
India Rubber Core.
Hooper's Core.

LIST OF SUBMARINE

Date.	From	To	Length in miles.	Weight per mile in tons.	reatest depth in fathoms.
1869	Moen	Bornholm	80	4	28
"	Bornholm	Libau	230	3.5	62
1870	Scotland	Orkney Isles .....	...	..	37
"	Salcombe	Brignogan	101	2.78	59
"	Beachy Head	Cape Antifer	70	11.75	34
"	Suez	Aden	1460	2.75	968
"	Aden	Bombay	1818	1.75	2060
"	Porthcurno.....	Lisbon	823	1.6	2625
"	Lisbon.....	Gibraltar	331	1.5	535
"	Gibraltar	Malta.....	1120	1.5	1450
"	*Porthcurno.....	Mid Channel	65	..	62
"	Marseilles	Bona	447	1.75	1600
"	Bona	Malta.....	386	1.75	650
"	Madras	Penang	1408	1.4	1284
"	Penang	Singapore	400	3.4	36
"	Singapore	Batavia	557	3.5	22
"	Malta	Alexandria	904	1.5	1440
"	Batabano	Santiago .....	..	..	..
"	Jersey	Guernsey	16	7	32
"	Guernsey	Alderney	18	7	30
"	Sta. Maura.....	Ithaca	7	3.5	180
"	Zante	Trepito	11	3.5	235
"	Sunium	Thermia	25	3.5	160
"	Patras	Lepanto	2	3.5	20
"	Dartmouth.....	Guernsey .....	..	..	58
"	Guernsey	Jersey .....	..	..	32
"	Porto Rico	St. Thomas	110	..	22
"	Santiago	Jamaica.....	140	..	..
"	Portpatrick	Donaghadee.....	25	..	160
1871	Javea	Iviza .....	..	2.75	430
"	Majorca	Minorca .....	..		93

* Not working February, 1872.

CABLES—*continued.*

LIST OF SUBMARINE

Date.	From	To	Length in miles.	Weight per mile in tons.	Greatest depth in fathoms.
1871	Villa Real	Gibraltar	155	3·5	84
"	Marseilles	Algiers .....	..	..	1625
"	Singapore	Saigon	620	2·5	60
"	Saigon	Hong Kong	975	3·5	630
"	Hong Kong	Shanghai	1100	..	42
"	Shanghai	Nagasaki	1200	..	{ 135
"	Nagasaki	Vladivostock			{ 80
"	Rhodes	Marmarice	22	..	..
"	Latakiah	Cyprus	86	..	..
"	Samos	Scala Nuova	11	1·5 Main	82
"	Mytelini	Aivali	13	2·5 Inter	33
"	Khania	Retimo	32	6·0 S. E.	about 200
"	Retimo	Khandia	41	..	152
"	Khandia	Rhodes	201	..	600
"	Khios	Chesmeh	6	..	33
"	Zante	Corfu	150	..	..
"	Zante	Cephalonia	18	..	203
"	Lowestoft	Greitseil	223	7·5	23
"	Anjer	Telok Betong	55	3·5	50
"	Banjoewangie	Port Darwin	1082	3·5	1580
"	St. Thomas	St. Kitts	133	..	1170
"	St. Kitts	Antigua	90	..	130
"	Antigua	Guadaloupe	84	..	..
"	Guadaloupe	Dominica	55	..	..
"	Dominica	Martinique	60	..	..
"	Martinique	St. Lucia	65	..	..
"	St. Lucia	St. Vincent	64	..	..
"	St. Vincent	Barbadoes	150	..	..
"	St. Vincent	Grenada	80	..	156
"	Grenada	Trinidad	120	..	..
"	Trinidad	Demerara	350	..	..
"	Porto Rico	Jamaica .....	...	..	..
Total number of Cables, 213; in Miles,			45,783 $\frac{1}{2}$		

CABLES—*continued.*

REMARKS.

Iron Covered Cable, coated with Bright and Clark's Compound.

Iron Covered Cable, coated with Bright and Clark's Compound.

" " "

Hooper's Core.

Hooper's Core.

Hooper's Core.

Iron Covered Cable, coated with Bright and Clark's Compound.

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PART III.

SUPPLEMENTARY TABLES.

TABLES XIV. and XV., pages 42 and 44, have been placed in the chapter referring to India; they hardly serve any distinctive purpose at present, there is so much that is uncertain as to the amounts which have or have not been debited to construction, extensions and maintenance, and Government telegrams.

Spain at one time (page 115) appears to have lost 11.45 francs per message, which is very improbable, but, for the year 1869, the loss upon each telegram was only 1s. 2 $\frac{3}{4}$ d. and if we compare the profit and loss columns in Table XV., we see that in most instances the loss has been diminished (although there are exceptions which can be traced to war and other disturbing causes); whether this decrease in every case arises from the increase of correspondence, or a better system of taking credit for the work done, and debiting the department only with the expenses strictly belonging to it, is not material; we know that both causes act in the same direction.

These tables illustrate that every nation has regarded telegraphy as a benefit worthy of a great pecuniary sacrifice to establish, and the successive reductions of tariff prove that they regard the indirect benefit to the state from the increased telegraphic facilities as so much direct gain to the national prosperity, which more than compensates for the loss upon the working, maintenance, and extension of this department.

Table XVI., p. 45, cannot be made more complete than it is with the data at my command; at one time countries were divided into zones or radii, each zone having a tariff according to its distance from the centre; these distances were sometimes altered at irregular intervals; varying tariff arrangements were made with neighbouring states, and the tariff was lowered at different times in accordance with the regulations of the convention. I had to accept the data I have given as the most complete which the different states are in a position to give, and my endeavour to arrive at the exact proportion of increase of correspondence in each country consequent upon the reduction of the tariff had to be abandoned.

Table XVII. compares population and area of states with length of wires, &c.

Table XIX. shews cost per mile of wire, &c.

Table XX. shews cost of construction and working expenses, with gross revenue, profit and loss, already referred to.

Tables XXI. and XXII., giving length of lines and wires, have very little practical bearing at present, beyond the effect which they must have in promoting emulation amongst states to rival each other in the efficiency and economy of the telegraph department.

This has been a notable result of the telegraph conventions which have been held at Paris, Vienna, and Rome. They have produced uniformity of system, of tariff, and of statistics; and this accumulation of exact data upon a uniform plan can well be left to work out its own conclusions, without further speculation at present. The tables are given here as starting points for future comparisons.

Tables XVIII., XXIII., deserve to be further elaborated. I regard this class of data as the only sound basis upon which any estimate can be made of the probability of a private telegraph enterprise being remunerative.

I regret that, notwithstanding a great deal of trouble, I have not yet obtained all the data required to make XXIII table so instructive as I believe it will be.

I am prepared to find that so far as regards trade, those countries which have one or more neighbouring states bordering upon them, will always shew more letters and more telegrams corresponding to their exports and imports than can be shewn by countries like America or India, removed from the countries with which they maintain commercial relations at so great a distance.

America will, however, be exceptionally favourable as compared with India, for reasons stated when dealing with American tariff, and there can be no doubt that nationality will have as much to do in this class of enterprise as in any other. The Teutonic and Scandinavian nations will, doubtless, excel the Latin and Asiatic, but I would anticipate great results from the development of telegraphy in such nations as China and Japan, in both of which activity is a marked characteristic.

It need hardly be stated that in those countries which supply each other with products or investments upon which there is often much speculation, such as cotton, railways, and state loans, &c., &c., there will be a larger proportion of telegrams than in countries which produce articles of limited demand, and possess few features to tempt investment of foreign capital.

I cannot yet supply a reason for the excess of telegrams, as compared with other nations, which this table gives for Norway and Sweden. But this special table is the one to be attended to by those interested in international telegraphy. I give it as a good starting point, upon which to accumulate other valuable statistics; the information respecting Spain, Portugal and America, and some other countries, is too incomplete to publish.

Table XXV. would, more than any other, illustrate the benefit which any nation derives from telegraphy. It is the basis of all calculation, as to the tariff which can in justice be applied to one class of telegram as compared with another. It establishes a method and system in the selection of extensions, and in economising transmissions, it gives the department full credit for the work done for Government, and restricts the use or abuse of the wires for service messages.

I have attempted other tables, but only to discover that they proved nothing. Those given will, a few years hence, be of undoubted value, and that must be sufficient excuse for publishing them in this paper.

TABLE XVII.

Comparison of the Population and Area of European States with the length of the Lines and Wires, and number of Stations and Telegrams from 1864 to 1869.

STATES.	Population.	1869.			1864.			1865.			1866.		
		Length of Lines in Miles.	Length of Wires in Miles.	Number of Stations per 100 Square Miles.	Length of Lines in Miles.	Length of Wires in Miles.	Number of Stations per 100 Square Miles.	Length of Lines in Miles.	Length of Wires in Miles.	Number of Stations per 100 Square Miles.	Length of Lines in Miles.	Length of Wires in Miles.	Number of Stations per 100 Square Miles.
Austria and Hungary	35,943,592	240,416	3·7	6·5	2·3	28·4	4·1	8·7	2·4	24·8	4·2	9·3	2·4
Baden	1,438,872	6,914	12·6	27·9	8·8	13·4	13·6	30·1	11·1	9·5	14·0	21·2	12·9
Bavaria	4,824,421	29,311	3·4	7·9	6·3	19·2	3·5	8·3	7·4	16·0	3·4	8·2	7·7
Belgium	4,961,644	11,395	14·1	33·7	5·6	14·3	15·2	41·1	6·1	11·0	16·6	47·2	7·3
Denmark	1,733,565	14,734	*	*	*	*	5·6	12·7	3·9	13·5	5·2	10·9	4·1
France	38,067,094	209,510	71	24·4	4·0	17·2	7·6	25·6	5·1	14·7	8·2	28·4	6·0
Germany (North)	29,910,502	160,318	4·3	13·6	3·3	25·3	4·7	15·3	3·8	20·4	5·0	16·7	4·1
Great Britain	31,000,000	121,114	10·7	51·8	6·9	†	11·6	55·5	6·5	†	†	†	†
Greece	1,329,479	19,395	1·4	1·4	0·9	22·0	2·3	2·5	1·6	16·6	2·8	3·3	1·9
Holland	3,628,468	12,685	8·2	21·6	2·4	7·5	8·3	23·3	2·7	6·3	9·1	26·6	3·8
Italy	24,273,776	109,879	77	15·6	3·0	†	7·8	20·3	2·8	†	7·1	18·7	3·2
Norway	1,890,000	121,621	1·4	1·8	6·3	8·1	1·5	1·9	6·2	8·6	1·7	2·1	6·4
Portugal	3,829,618	34,619	3·4	4·6	1·9	49·9	4·4	6·6	2·4	41·1	4·7	7·4	2·7
Roumania	5,000,000	46,823	3·3	3·5	0·9	23·0	3·4	3·7	0·9	19·9	3·5	4·0	1·0
Russia	78,394,471	7,921,453	0·2	0·4	0·5	101·4	0·2	0·4	0·5	89·3	0·2	0·4	0·6
Spain	16,732,052	196,851	3·0	6·7	1·3	26·2	3·0	7·1	1·3	21·1	2·7	6·5	0·9
Sweden	4,158,757	170,583	1·7	3·0	4·2	19·6	1·7	3·3	4·7	14·2	1·9	4·3	5·9
Switzerland	2,510,494	15,998	11·2	18·4	8·9	†	11·5	20·2	10·0	†	12·0	22·2	11·3
Wurtemburg	1,778,396	75,807	1·2	1·8	7·3	14·0	1·3	2·0	8·2	11·3	1·4	2·3	9·0

TABLE XVII—*continued*.

STATES.	Population.	1869.				1867.				1868.				1869.			
		Length of Lines per 100,000 Miles, in Geo. Miles.	Length of Wires per 100,000 Miles, in Geo. Miles.	Number of Stations per 100,000 Inhabitants.	Number of Inhabitants per 100,000 Miles, in Geo. Miles.	Length of Lines per 100,000 Miles, in Geo. Miles.	Length of Wires per 100,000 Miles, in Geo. Miles.	Number of Stations per 100,000 Inhabitants.	Number of Inhabitants per 100,000 Miles, in Geo. Miles.	Length of Lines per 100,000 Miles, in Geo. Miles.	Length of Wires per 100,000 Miles, in Geo. Miles.	Number of Stations per 100,000 Inhabitants.	Number of Inhabitants per 100,000 Miles, in Geo. Miles.	Length of Lines per 100,000 Miles, in Geo. Miles.	Length of Wires per 100,000 Miles, in Geo. Miles.	Number of Stations per 100,000 Inhabitants.	Number of Inhabitants per 100,000 Miles, in Geo. Miles.
Austria and Hungary	35,943,592	240,415	4.6	10.8	2.8	5.2	12.3	3.3	13.6	7.1	15.9	4.0	10.9				
Baden	1,438,872	5,914	14.1	33.6	13.2	7.3	14.1	34.7	14.0	6.8	†	†	†				
Bavaria	4,824,421	29,311	3.6	8.7	8.0	14.0	4.3	11.6	8.8	15.5	10.3	26.8	11.2	12.2			
Belgium	4,961,644	11,395	18.3	56.8	7.6	5.0	19.3	59.5	8.2	4.3	19.9	63.3	8.7	3.7			
Denmark	1,883,565	14,734	5.6	13.5	5.2	7.1	6.3	16.7	5.2	6.7	6.6	17.8	5.9	6.3			
France	38,067,094	209,510	9.0	28.4	6.6	11.5	9.8	27.2	7.4	10.6	11.0	29.9	8.2	8.0			
Germany (North)	29,910,502	160,318	7.4	24.3	6.9	10.1	7.9	25.9	6.8	7.2	8.4	26.7	7.3	6.2			
Greece	1,325,479	19,395	2.8	3.3	1.9	13.4	2.8	3.3	2.1	14.2	4.4	5.0	2.7	1.0			
Holland	3,628,468	12,685	9.9	29.2	5.3	10.8	36.2	5.4	3.4	11.9	41.6	6.1	3.0				
Italy	24,273,776	109,879	7.5	21.2	3.6	†	7.8	23.1	3.9	15.3	8.0	23.8	4.2	14.1			
Norway	1,800,000	121,621	1.9	2.5	6.8	6.4	2.0	3.0	7.3	5.7	†	3.5	7.5	5.4			
Portugal	3,829,618	34,619	4.6	7.7	3.0	33.6	4.4	8.3	3.0	32.1	†	†	†	†			
Roumania	5,000,000	46,823	3.5	4.5	1.0	14.6	3.5	4.7	1.0	12.5	3.6	4.9	1.2	11.8			
Russia	78,394,471	7,921,453	0.2	0.4	0.6	57.2	0.2	0.5	0.7	45.1	†	†	†	37.9			
Spain	16,732,052	195,851	2.9	6.6	1.0	30.8	3.0	6.9	1.1	32.6	3.0	7.0	1.1	25.5			
Sweden	4,168,757	170,583	1.9	4.6	6.1	10.4	2.0	4.8	6.9	10.0	2.0	4.9	6.7	9.2			
Switzerland	2,510,494	16,998	13.0	25.1	13.2	†	14.4	30.4	15.6	†	15.4	33.3	18.2	2.2			
Wurtemburg	1,778,396	75,807	1.4	2.3	9.3	9.6	1.4	2.4	10.3	8.2	†	†	†	†			

Norw.—* In 1864 Denmark was at war. No data procurable.

† No data.

TABLE XVIII.

Statement shewing the proportion of Inland Telegrams to Inland Letters:—

YEAR.	BELGIUM.		SWITZERLAND.		UNITED KINGDOM.	
	Telegrams.	Letters.	Telegrams.	Letters.	Telegrams.	Letters.
1860	1	to	218	1	to	84
1861	1	to	195	1	to	87
1862	1	to	187	1	to	80
1863	1	to	114	1	to	74
1864	1	to	89	1	to	70
1865	1	to	73	1	to	69
1866	1	to	37	1	to	69

NOTE.—In the number of messages for the United Kingdom both internal and external telegrams are included.

TABLE XIX.

Statement shewing the cost (per mile of telegraphic wire) in each of the four years ending on 31st December, 1865, of working and maintaining Telegraphs in the UNITED KINGDOM, SWITZERLAND, and BELGIUM:—

YEAR.	UNITED KINGDOM.			SWITZERLAND.			BELGIUM.		
	£	s.	d.	£	s.	d.	£	s.	d.
1862	5	2	1	4	11	8	5	8	4
1863	4	5	6	5	1	8	4	19	2
1864	4	0	10	5	0	0	5	0	0
1865	4	10	0	5	5	0	4	18	4
Average annual cost per mile of wire during the last four years ..	4	9	7	4	19	7	5	1	5

TABLE XX.
Statement of Total Cost of Construction from commencement of Lines with Interest thereon at 4 per cent., Maintenance and Working Expenses, Gross Revenue, and Profit and Loss, from 1864 to 1869.

STATES.	1864.				1865.							
	Total Cost of Construction to date.	Interest at 4 % on Cost of Construction to date.	Maintenance and Working Expenses.	Gross Revenue for 1864.	Profit.	Loss.	Total Cost of Construction to date.	Interest at 4 % on Cost of Construction to date.	Maintenance and Working Expenses.	Gross Revenue for 1865.	Profit.	Loss.
Austria and Hungary ..	583,845	23,363	210,679	197,928	£	36,104	629,243	25,113	214,669	208,914	£	30,928
Baden	29,563	1,182	9,235	10,339	..	78	31,930	1,277	10,082	10,551	..	818
Bavaria	71,568	2,862	21,231	25,292	1,199	..	72,272	2,890	22,168	27,675	2,617	..
Belgium	54,748	2,191	22,125	31,575	7,259	..	66,301	2,652	26,420	34,625	5,563	..
Denmark	109,149	7,365	15,122	14,067	..	8,420	111,216	4,448	14,332	17,398	..	1,382
France*	817,933	32,718	*61,606	292,654	*198,330	..	859,101	34,364	*114,288	325,339	*176,677	..
Germany (North)	585,398	23,415	139,485	163,057	157	..	621,402	24,866	155,645	184,122	3,621	..
Great } Indo-European	..	..	..	..	..	..	..	..	63,655	73,188	..	..
Britain } Indian .....	..	..	..	..	..	..	..	..	..	..	..	..
Greece	40,197	1,607	4,686	3,573	..	2,720	46,891	1,875	6,199	4,515	..	3,559
Holland	109,857	4,394	33,893	37,273	..	1,014	121,491	4,859	38,295	43,786	632	..
Italy†	69,811	2,792	156,988	134,293	..	26,487	83,458	3,338	162,788	152,671	..	3,456
Norway	97,910	3,916	19,386	16,420	..	6,882	99,118	3,964	20,122	17,965	..	6,121
Portugal	27,246	1,089	24,732	8,615	..	17,206	40,987	1,639	33,365	8,563	..	26,451
Russia	608,132	24,325	267,878	251,771	..	40,432	766,032	31,441	284,848	281,726	..	34,663
Spain|| .....	194,758	7,790	177,846	61,164	..	124,472	195,198	7,807	172,378	62,375	..	117,810
States of the Church	18,107	724	5,271	5,117	..	878	18,563	742	5,272	4,616	..	1,398
Sweden	182,566	7,303	30,608	53,848	15,937	..	210,624	8,224	31,928	64,428	24,076	..
Switzerland¶	43,839	1,763	19,504	26,303	6,046	..	46,223	1,848	23,926	30,743	4,969	..
Wurtemburg	37,128	1,485	7,595	7,861	..	1,219	40,794	1,631	9,026	9,059	..	1,598

REMARKS.—FRANCE. * The Returns under the head of Maintenance and Working Expenses do not include Salaries of Staff prior to 1869.

Indo-European. † These figures include Total Cost of Construction up to the end of March, 1869.

ITALY. ‡ The Cost of Construction is only calculated from 1861: no data prior to that period being obtainable.

TABLE XX—*continued.*

STATES.	1866.				1867.			
	Total Cost of Construction to date.	Interest at 4 3/0 on Cost of Construction to date.	Maintenance and Working Expenses.	Gross Revenue for 1866.	Profit.	Loss.	Total Cost of Construction to date.	Interest at 4 0/0 on Cost of Construction to date.
Austria and Hungary ..	669,191	26,767	262,096	247,660	£	£	274,045	282,427
Baden	33,209	1,328	11,838	11,752	..	1,424	35,357	1,414
Bavaria	72,272	2,890	24,860	28,470	780	..	75,499	3,019
Belgium	81,403	3,286	33,478	38,488	1,754	..	87,813	3,512
Denmark	113,912	4,556	14,446	11,672	..	7,330	118,522	4,740
France*	919,367	36,774	*105,116	352,376	*210,486	..	986,994	38,279
Germany (North)	655,550	26,182	169,096	174,711	..	20,567	705,510	28,220
Great Indo-European .....	..	..	63,655	92,092	..	..	..	..
Britain } Indian .....	..	..	..	..	..	..	63,655	93,519
Greece	48,311	1,932	7,864	5,258	..	4,538	48,811	1,952
Holland	140,762	5,630	41,332	43,321	..	3,641	160,268	6,410
Italy†	94,776	3,791	147,349	160,733	9,593	..	102,056	4,082
Norway	122,624	4,904	21,319	20,081	..	6,142	137,117	5,484
Portugal	49,159	1,966	38,827	9,238	..	31,555	51,561	2,062
Russia	908,968	36,358	327,845	330,978	..	33,225	977,286	39,091
Spain|| .....	195,358	7,814	141,157	53,706	..	95,265	..	..
States of the Church ..	18,947	757	5,621	4,140	..	2,238	19,298	771
Sweden	241,304	9,672	36,424	70,144	24,048	..	256,572	10,262
Switzerland†	49,271	1,970	24,447	29,104	2,687	..	55,993	2,239
Wurtemburg	45,711	1,748	10,222	10,469	..	1,511	46,324	1,862

PORTUGAL. ** No data. ROMANIA. § No data obtainable prior to 1868.
 SPAIN. || No data appear for 1867, 1868, or 1869, although the length of Lines, Wires, &c., increased regularly.

TABLE XXX—continued.

STATES.	1868.					1869.						
	Total Cost of Construction to date.	Interest at 4 % on Cost of Construction to date.	Main-tenance and Working Expenses.	Gross Revenue for 1868.	Profit.	Loss.	Total Cost of Construction to date.	Interest at 4 % on Cost of Construction to date.	Main-tenance and Working Expenses.	Gross Revenue for 1869.	Profit.	Loss.
Austria and Hungary ..	795,016	31,800	296,171	310,603	£	17,368	850,477	34,019	280,457	292,409	..	22,067
Baden	36,859	1,474	12,640	12,690	..	1,424	40,790	1,631	13,996	15,122	..	505
Bavaria	94,042	3,761	20,482	30,335	6,092	..	142,253	5,696	21,866	35,213	7,657	..
Belgium	92,071	3,682	47,419	47,884	..	3,217	97,186	3,987	51,957	52,943	2,901	..
Denmark	127,701	5,108	16,732	14,424	..	7,416	137,666	6,506	18,044	16,331	..	7,219
France*	1,083,383	43,335	*110,956	399,233	*244,939	..	1,186,832	47,473	413,320	426,264	..	34,529
Germany (North)	746,939	29,879	292,664	279,920	..	42,623	759,674	30,386	335,399	307,897	..	57,888
Great Britain } Indo-European	..	..	63,655	103,744	..	..	*960,101	38,404	95,494	76,230	..	57,668
India } Indian .....	..	..	..	..	..	..	..	264,070	145,042	..	..	..
Greece	50,821	2,032	9,528	5,316	..	6,244	53,820	2,152	15,506	5,970	..	11,688
Holland	177,111	7,084	53,474	41,913	..	18,645	193,658	7,746	62,181	46,300	..	23,627
Italy†	104,056	4,162	163,608	182,121	14,351	..	104,056	4,162	168,608	188,736	25,966	..
Norway	151,930	6,077	30,136	24,492	..	11,721	184,859	7,394	26,874	27,601	..	6,667
Portugal	61,934	2,077	34,747	10,400	..	26,424	**	**	**	**	..	..
Roumania§ .....	..	..	..	..	..	..	1,704	68	55,007	41,866	..	13,209
Russia	1,015,686	40,627	291,886	422,074	89,562	..	1,064,425	42,577	330,041	429,628	120,010	..
Spain|| .....	..	..	127,405	52,869	..	..	..	137,001	70,639	..	..	..
States of the Church ..	19,450	778	6,143	3,828	..	3,093	19,673	786	5,613	4,712	..	1,687
Sweden	262,824	10,512	39,756	46,280	..	3,988	268,324	10,732	40,356	49,306	..	1,782
Switzerland¶	61,532	2,461	33,899	36,847	¶487	..	66,741	2,669	36,924	42,134	¶2,541	..
Wurtemburg	50,455	2,018	12,189	12,570	..	1,637	**	**	**	..	..	..

SWITZERLAND. ¶ Since 1867 the Administration pays Interest at 4 % on £20,000 lent by the Government ; this payment is included in Maintenance and Working Expenses.

WURTEMBERG. ** No data.

TABLE XXI.
Length of Telegraphic Lines in Geographical Miles.

STATES.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
Austria	887,528	1,634,512	1,921,974	2,242,241	2,701,814	3,462,446	3,812,763	4,406,411	4,633,824	5,385,446	6,133,886
Hungary	151,878	162,687	164,683	250,558	250,364	368,878	463,188	634,352	..
Baden	270,305	399,793	429,467	499,606	579,467	644,740	654,452	664,163	664,163	679,276
Bavaria	221,747	362,565	377,132	391,700	422,993	432,165	468,313	570,285	766,595
Belgium	305,914	629,094	629,094	620,461	657,689
Denmark
France	1,160,964	1,318,297	1,614,943	1,799,495	2,921,680	2,256,673	2,451,638	2,880,394	3,179,440	3,807,963	3,922,462
Germany, North
Greece	115,459
Netherlands	689,575
Norway	1,402,243
Portugal
Romania
Russia
Spain
States of the Church
Sweden
Switzerland
Wurtemburg
Totals	2,048,492	3,223,114	5,461,156	8,028,335	11,114,571	14,736,231	18,257,706	20,906,420	29,605,602	35,438,373	41,979,962

AUSTRIA AND HUNGARY.—*The Lines of Hungary and Transylvania figure in the total for 3,386,838 geographical miles. † The Lines of Hungary and Transylvania, augmented by those of Croatia, which were incorporated in the kingdom of Hungary in April, 1868, are 4,107,571 geographical miles, of which 1,683,7 geographical miles belong to private Companies. ‡ 1,405,265 geographical miles belong to private Companies.

BADEN.—* The Baden Lines situated in the territories of Wurtemberg and Switzerland are included.

DENMARK.—* The situation of 1864 having undergone modification on account of the war, cannot be indicated.

FRANCE.—* Exclusive of the Railway Companies' Lines. † The first law in France respecting private telegraphic correspondence was

made November 29th, 1850; it was only applied from the 1st March, 1861. ‡ These figures may be analysed thus: Land Lines of administration, 22,089,878 geographical, miles, Semaphore system, 767,268 geographical, miles, Submarine cables, 308,072 geograph. miles, Atmospheric tubes, 7,681 geographical, miles.

GERMANY (North).—* The Lines of Hanover, Schleswig, Holstein, Nassau, and Saxony were annexed to the Prussian System in 1867.

† In 1868 all the Lines were united, the whole forming the Lines of the North German Confederation.

GREAT BRITAIN.—* Indo-European Lines: these figures are divided thus—

1863. 1864. 1865. 1866. 1867. 1868.

Submarine cables 906,933..1,175,6..1,181,0..1,181,0..1,184,2
Land lines .. 355,0 .. 355,0 .. 355,0 .. 355,0 .. 355,0 ..

TABLE XXI.—*continued.*

STATES.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
Austria	6,912,913	7,135,094	7,187,227	8,903,357	9,263,656	10,302,147	10,584,376	11,249,331*	12,640,479†	{ 11,798,701 5,506,762†
Hungary	571,094	665,404	675,817	746,172	750,165	805,633	831,256	834,062	837,677	
Baden	681,968	681,968	688,442	942,022	1,026,189	1,051,547	1,027,268	1,067,733	1,275,453	3,029,499
Bavaria	819,711	1,019,715	1,428,141	1,612,121	1,737,293	1,898,613	2,092,844	2,200,761	2,276,285	
Belgium	882,134	1,067,194	1,073,668	1,117,370	1,208,721	1,776,926	1,828,404	1,936,088	1,979,250	
Denmark	12,385,533	12,806,871	13,966,326	14,396,871	15,030,821	16,007,374	17,386,418	18,965,326	20,669,117	23,172,899†
France	4,165,863	4,676,202	5,240,355	6,211,561	7,022,235	7,638,142	8,152,776	11,871,468*	12,738,987†	13,469,880
Germany, North . . . . .	..	..	..	1,261,965*	2,070,184*	2,076,679*	2,076,679*	2,078,816*		
Great Indo-European										
Great Britain	116,459	116,459	261,133	261,133	274,621	463,457	649,783	649,783	560,573	12,357,440
India . . . . .	..	..	6,471,686	7,034,418	7,545,894	7,653,261	7,811,344	8,328,295	8,619,563	8,847,246
Italy	816,610	875,336	880,929	989,663	1,061,871	1,063,849	1,163,986	1,265,192	1,370,627	1,518,297
Netherlands	1,402,243	1,505,294	1,512,308	1,682,260	1,789,088	1,834,948	2,089,607	2,316,760	2,488,321	..
Norway	1,079,064	1,123,017	1,163,249	1,169,993	1,186,970	1,661,164	1,659,060	1,618,596	1,687,346*	
Portugal	1,288,941	1,499,359	1,499,359	1,580,289	1,618,596	1,640,177	1,640,177	1,640,177	1,732,437	
Romania	9,481,736	11,241,688	13,102,534	15,167,323	18,361,353	19,289,348	19,999,372	20,312,239	21,546,749	
Russia	3,071,723	4,467,324	4,762,986	5,395,856	5,890,610	6,071,353	5,477,868	5,829,103	6,053,549	
Spain	772,609	254,659	305,376	340,984	342,602	361,446	366,881	368,500	347,998	363,105
States of the Church	2,554,684	2,560,070	2,888,114	2,836,319	2,978,756	3,042,960	3,273,340	3,256,615	3,415,777	3,496,706*
Sweden	1,555,089	1,613,200	1,711,827	1,722,186	1,791,785	1,861,673	1,920,194	2,087,988	2,313,406	2,464,905
Switzerland	468,691	536,996	710,099	862,981	929,289	1,022,089	1,082,031	1,084,459	1,096,922	13,985,935
Wurtemburg . . . . .	..	..	..	..	..	..	..	..	..
Totals	49,673,298	58,871,261	65,469,997	73,779,734	80,223,882	85,802,603	89,217,072	97,093,721	103,663,020	110,961,895

Italy.—* Information prior to 1861 cannot be obtained on account of the political situation in existence before that time. The first line was inaugurated December, 1847, between Pisa and Leghorn.

NETHERLANDS.—* Exclusive of Railway Companies' Lines. The Lines were opened for private correspondence December 1st, 1852.

PORTUGAL.—* The Electric Telegraph was established in 1855, but the earliest information which can be obtained only goes back to the latter part of 1865; up to the 19th July in that year all the National Service was transmitted gratuitously; the Service of International Correspondence only commenced on September 26th. † The decrease on the preceding year arises from the fact that some Lines

have been remounted and put up, for the most part, on the supports already established.

ROMANIA.—* The first Lines were constructed in 1854.

SPAIN.—The first Line was established from Madrid to Irún and Bilbao; Telegraphic Service was inaugurated May 1st, 1855.

SWEDEN.—* Telegraphic miles belong to Railways or to private Companies.

SWITZERLAND.—Exclusive of Railway Lines, comprising 747.2 geographical miles.

TABLE XII.
Length of Telegraph Wires in Geographical Miles.

STATES.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
Austria	887,530	1,698,985	1,992,815	2,354,355	2,929,227	3,700,649	5,289,555	5,975,748	6,850,491	8,216,802	9,497,489
Hungary	161,048	161,859	245,810	418,461	519,946	622,752	663,049	755,722	897,997
Baden*	431,625	560,573	567,587	626,936	732,144	739,586	1,288,402	1,295,955	1,295,955	1,309,444
Belgium	540,071	861,632	1,133,017	1,388,039	1,377,964	1,446,485	1,627,228	1,793,404	2,073,421
Denmark	347,458	347,458	347,458	1,397,387	1,397,387	1,403,862	1,565,720
France*	1,160,964	1,429,788	1,864,347	3,679,057	3,413,635	4,174,267	5,518,187	6,835,282	7,927,791	9,635,925	24,772,021†
Germany (North)	267,067	769,221	947,849	1,040,487	1,377,856	1,442,384	1,538,151
Greece	73,376	535,715	616,685	1,168,626	1,679,023	1,771,823
Netherlands*	1,133,017	1,247,667	1,247,667
Norway	190,454	504,462	663,084	794,191	906,874	1,198,840
Portugal	5,838,275	6,981,795	9,862,105
Romania	5,122,316	7,039,813	7,302,565
Russia	135,962	451,588	451,588	451,588	451,588	491,513
Spain	135,962	135,962	135,962	135,962	135,962	135,962	135,962
States of the Church	37,767	556,267	1,294,876	2,028,100	2,900,524	3,231,796	3,367,507
Sweden	1,035,901	1,294,876	1,307,825	1,430,837	1,703,734	1,822,539	1,877,571	2,071,802
Switzerland*	266,097	266,097	266,097	354,904	471,065	518,490	544,226
Wurtemburg
Totals	2,048,494	3,559,398	5,118,854	8,752,111	10,350,394	14,000,110	20,033,532	25,277,451	40,433,453	48,251,986	50,470,420

AUSTRIA AND HUNGARY. • The wire of the Hungarian Government is included in the figures for the years 1867 and 1868, thus:—1867, 8,955,486 geo. miles, 1868, 11,172,436 geo. miles. † The figures for 1869 include 1,744,277 miles of wire belonging to railways.

BADEN. * See preceding Table, observation 1.

DENMARK. * See preceding Table, observation 1.

FRANCE. * These figures do not include the railway company's wires. † The development of the lines of wire for the years previous to 1859 is not exactly known. * There were in 1869 61,328,064 geo. miles of wire (excluding the railway companies wires); Semaphore Lines 1,136,793 geo. miles; Submarine Cables 308,072 geo. miles.

GERMANY (North). * See preceding Table, observations 1 and 2.

TABLE XXXII—*continued.*

STATES.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
Austria	10,872,594	11,672,073	13,313,060	21,114,746	18,325,204	21,963,430	23,450,498	25,969,131*	29,583,780	{ 26,465,986 11,798,712†
Hungary	939,594	1,146,611	1,156,972	1,652,476	1,661,291	1,781,264	1,846,818	1,992,653	2,057,394	...
Baden*	1,369,081	1,366,095	1,923,971	2,366,675	2,454,870	2,423,577	2,561,986	3,418,474	7,860,064	
Bavaria	2,218,016	2,424,117	2,691,312	3,366,699	3,840,388	4,690,161	6,389,335	6,425,826	6,782,996	7,220,017
Belgium	2,247,149	2,478,070	2,515,296	2,900,524	300...	1,875,952	1,619,675	1,995,189	2,461,982	2,634,534
Denmark	32,368,971	37,116,169	45,922,726	48,734,306	61,301,939	63,723,369	59,627,438	59,609,113	57,109,463	62,772,029†
France*	11,962,740	13,557,767	15,588,557	18,978,976	21,913,415	24,538,395	26,895,556	39,082,883*	41,656,224*	42,921,675
Germany (North) .....	...	...	...	1,616,977*	1,939,617*	1,885,664*	1,891,059*	1,891,059*	1,884,296*	...
Great Indo-European .....	...	...	...	...	...	...	...	...	...	20,307,444
Britain } Indian	115,459	115,459	115,459	12,927,186	14,177,821	274,621	503,922	641,503	652,294	971,157
Greece	8,578,558*	1,998,588	2,110,641	2,484,652	2,743,573	2,961,059	3,382,164	20,620,912	23,307,782	26,173,776*
Italy	1,902,335	1,998,588	1,887,282	1,911,562	2,143,021	2,250,387	2,316,749	2,652,339	3,707,124	4,597,999
Netherlands*	1,771,823	1,887,282	1,887,282	1,911,562	2,143,021	2,250,387	2,316,749	3,051,053	3,669,357	5,285,902
Norway	1,483,713	1,521,777	1,564,642	1,664,642	1,781,131	2,257,546	2,662,777	2,882,565	3,206,685	4,282,319
Portugal	1,353,684	1,564,103	1,654,103	1,645,033	1,645,033	1,748,083	1,918,575	2,152,732	2,298,945	...
Romania	14,593,801	18,607,919	20,941,395	26,399,800	32,466,086	35,541,130	38,573,840	39,184,051	41,072,952	13,765,619
Russia	7,853,967	8,731,246	10,957,894	12,343,950	13,310,254	13,913,990	12,809,568	13,021,604	13,562,755	490,974
Spain	1,006,227	330,333	414,900	432,704	434,323	461,299	471,550	492,592	474,788	8,394,038*
States of the Church	3,616,982	4,265,130	4,753,276	5,207,199	5,716,802	7,429,355	7,978,599	8,020,886	8,572,951	5,329,551
Sweden	3,365,600	2,278,983	2,626,009	2,676,078	2,937,173	3,232,012	3,560,911	4,016,815	4,870,192	23,055,281
Switzerland*	2,214,239	2,278,983	2,626,009	2,676,078	2,937,173	3,232,012	3,560,911	4,016,815	4,870,192	23,055,281
Turkey	685,745	765,703	970,294	1,138,736	1,387,514	1,579,260	1,762,166	1,803,169	1,855,018	...
Totals	98,304,739	119,782,011	142,960,761	170,178,921	180,829,531	202,948,393	219,538,686	241,572,524	254,451,091	272,028,923

GREAT BRITAIN. * Indo-European Line. These figures can be analysed thus:—

ITALY. * 5,205,404 geo. miles of Railway Companies wires are included. See preceding Table, observation 1.

NETHERLANDS. * 1,667,163 geo. miles belong exclusively to railway companies or private companies, but the railway companies' wires are for the most part suspended from the posts of the "Telegraph Administration."

SWEDEN. * The railway companies' wires are not included. SWITZERLAND. * The railway companies' wires are not included.

TABLE XXXI.
Statement showing Population, Trade, and Telegraphy.

1864.

STATES.	Population.	Total Imports and Exports.	Internal Messages.	International Messages.	Transit Messages.	Internal Receipts.	International Receipts.	Number of External Telegrams for every £1,000 of Imports and Exports.
Austria *	35,019,058	£86,956,000	1,197,333	393,631	69,687	£11,304	£180,530	*** 1.8
Belgium ..	4,940,570	106,223,000	252,301	197,647	96,649	142,637	102,294	***
France ..	37,332,225	365,024,000	2,181,019	No Returns.	No Returns.	3,284	340	1.3
Greece † ..	1,325,479	2,864,000	577,86	344,836	262,106	204,945	16,928	3.8
Holland ..	3,491,864	65,646,000	165,096	38,820	160,742	10,872	6,325	***
Norway ..	1,490,047	No Returns.	64,768,000	678,707	133,025	234,380	14,738	2.9
Russia ..	77,008,448	34,027,000	649,461	20,134	55,290	6,874	3.9	
Spain ..	16,195,291	10,586,000	187,121	52,639	25,274	17,600	18,308	4.9
Sweden ..	4,070,100							

1865.

STATES.	Population.	Total Imports and Exports.	Internal Messages.	International Messages.	Transit Messages.	Internal Receipts.	International Receipts.	Number of External Telegrams for every £1,000 of Imports and Exports.
Austria *	35,019,058	£87,525,000	1,361,345	420,011	74,992	£13,812	£20,408	*** 2.3
Belgium ..	4,984,351	106,361,000	332,721	252,133	89,183	166,373	116,708	***
France ..	37,332,225	362,984,000	2,661,292	No Returns.	8,233	3,537	979	1.9
Greece † ..	1,325,479	4,177,000	75,733	289,946	267,429	19,106	24,981	3.7
Holland ..	3,628,107	78,294,000	419,054	50,376	50,376	11,289	6,441	
Norway ..	1,701,756	8,933,000	174,312	174,648	174,648	266,172	13,466	5.6
Russia ..	77,008,448	56,088,000	826,050	138,824	24,263	41,254	21,122	3.1
Spain ..	16,325,351	29,126,000	265,278	69,241	26,749	18,944	17,116	4.7
Sweden ..	4,114,200	11,836,000						6.8

TABLE XXII.—*continued.*

1866.						
STATES.	Population.	Total Imports and Exports.	Internal Messages.	International Messages.	Transit Messages.	Number of External Telegrams for every £1,000 of Imports and Exports.
Austria *	35,019,058	£77,022,000	2,016,766	490,706	93,823	£222,252
Belgium ..	4,827,833	119,251,000	692,536	306,596	128,873	£22,187
France ..	38,067,094	403,764,000	2,944,079	1,266,441	141,271	127,180
Greece †	1,326,479	4,238,000	90,333	10,819	...	...
Holland ..	3,552,575	80,463,000	46,919	33,438	291,543	4,277
Norway ..	1,701,756	9,813,000	196,20	76,906	...	20,968
Russia ..	77,008,448	65,389,000	1,041,817	256,530	...	22,353
Spain.....	16,408,821	25,520,000	725,231	13,626	294,252	7,022
Sweden ..	4,160,700	12,295,000	300,900	94,029	27,288	30,980
					66,592	34,096
					20,346	19,611
						18,264
						7.6

1867.						
STATES.	Population.	Total Imports and Exports.	Internal Messages.	International Messages.	Transit Messages.	Number of External Telegrams for every £1,000 of Imports and Exports.
Austria *	32,573,002	£99,597,000	1,458,020	651,588	118,326	£208,231
Belgium ..	4,897,794	114,634,000	817,652	338,918	132,149	£24,069
France ..	38,067,094	364,124,000	3,201,898	1,346,089	97,617	147,609
Greece †	1,322,479	No Returns.	92,461	11,777	...	1,285
Holland ..	3,592,415	83,441,000	492,733	370,340	249,964	22,341
Norway ..	1,720,500	9,406,000	222,258	93,979	...	21,875
Russia ..	77,008,448	79,542,000	1,203,436	294,574	...	14,403
Spain.....	16,664,118	27,796,000	605,608	136,668	31,915	34,143
Sweden ..	4,195,700	14,602,000	349,288	119,839	60,626	32,382
						22,956
						17,296

TABLE XXXII.—*continued.*

STATES.	Population.	Total Imports and Exports.	Internal Messages.	International Messages.	Transit Messages.	Internal Receipts.	International Receipts.	Number of External Telegrams for every £1,000 of Imports and Exports.
Austria*	32,573,002	£122,074,000	1,350,065	684,662	189,176	£207,865	£25,914	5·6
Belgium	4,961,644	124,651,000	97,038	376,899	163,862	£21,971	371,554	3·0
France	38,067,094	364,608,000	3,422,863	1,488,794	116,588	£4,303	21,713	4·0
Greece†	1,325,479	No Returns.	87,189	12,933	213,833	21,713	20,200	***
Holland	3,628,488	87,725,000	838,948	468,657	140,226	739	16,151	5·3
Norway	1,720,500	9,923,000	247,746	183,754	7,989	376,111	8,096	14·1
Russia	78,394,471	83,858,000	1,575,577	568,659	185,265	67,015	40,041	4·5
Spain	16,701,179	No Returns.	358,779	155,247	56,586	35,230	17,640	***
Sweden	4,173,100	14,286,000	358,779	155,247	56,586	22,860	16,768	10·8

STATES.	Population.	Total Imports and Exports.	Internal Messages.	International Messages.	Transit Messages.	Internal Receipts.	International Receipts.	Number of External Telegrams for every £1,000 of Imports and Exports.
Austria	21,617,228	£129,573,000	1,766,764	812,219	339,922	£111,905	£68,915	6·2
Belgium	4,961,644	134,245,000	1,108,737	426,676	188,173	23,960	28,961	3·1
France	38,067,094	363,104,000	4,729,588	1,362,450	227,017	226,452	168,529	3·7
Holland	3,628,468	91,256,000	949,662	468,657	213,833	24,776	21,625	5·1
India (British)†	1859	200,098,890	104,650,000	481,824	40,862	***	119,963	22,573
"	1870	200,098,890	100,396,113	***	43,291	***	***	0·4
"	1871	200,098,890	96,542,867	67,020	***	***	***	0·6
Italy	24,273,776	68,760,000	1,643,147	512,577	180,732	111,469	73,087	8·7
Norway	1,800,000	9,787,000	266,163	140,226	739	17,031	10,310	14·3
Russia	78,394,471	94,637,000	1,886,849	383,754	5,989	432,295	46,816	4·0
Sweden	4,158,757	14,586,000	384,128	165,247	56,586	24,904	18,451	10·6

AUSTRIA.—*—The Population up to 1868, and the Telegraphic Statistics up to 1867, apply to the **Austro-Hungarian Empire**, the subsequent figures for 1867-8-9 apply to **Austria only**.

GREECE.—†—The average Population 1851-59 is here given.

This Table is confined to those countries for which Trade Returns have been obtained from our Board of Trade.

TABLE XXIV.
APPENDIX D OF MR. SCUDAMORE'S REPORT.

Statements of the length in miles of the Telegraphic Lines and Wires in the United Kingdom, of the number of Offices open to the public, of the number of Instruments employed, and of the number of Messages transmitted in each year from 1855 to 1865.

Length in Miles of Telegraph-Lines.

TELEGRAPH COMPANIES.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.
Electric and International.....	5,228	6,398	6,637	6,103	6,272	6,541	6,727	7,597	8,282	8,658	9,306
British and Irish Magnetic.....	3,283	3,324	3,441	3,656	3,719	3,768 $\frac{1}{4}$	3,903	4,126 $\frac{1}{4}$	4,196 $\frac{1}{4}$	4,329 $\frac{1}{4}$	4,401
South Eastern Railway.....	285	301	301	308	308 $\frac{1}{4}$	308 $\frac{1}{4}$	309 $\frac{1}{4}$	314	316 $\frac{1}{4}$	318	323 $\frac{1}{4}$
London Brighton & South Coast Railway	..	43	109	119	128 $\frac{1}{4}$	162 $\frac{1}{4}$	192	199 $\frac{1}{4}$	212	217 $\frac{1}{4}$	240 $\frac{1}{4}$
London District.....	..	..	..	..	..	73 $\frac{1}{4}$	92 $\frac{1}{4}$	103	107	115	123
United Kingdom.....	..	..	..	..	..	305	371 $\frac{1}{4}$	381	1,343	1,672	1,672
Total.....	8,796	9,066	9,488	10,186	10,423	10,854 $\frac{1}{4}$	11,528 $\frac{1}{4}$	12,711 $\frac{1}{4}$	13,944 $\frac{1}{4}$	14,981	16,066 $\frac{1}{4}$

Length in Miles of Wires used.

TELEGRAPH COMPANIES.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.
Electric and International.....	27,711	28,627	29,498	30,733	31,346	32,148	32,787	35,066	39,756	41,691	45,044
British and Irish Magnetic.....	14,926	15,008	16,688	16,632	16,595	16,661	17,043	16,33 $\frac{1}{4}$	17,257 $\frac{1}{4}$	18,564	18,668
South Eastern Railway.....	1,083	1,220	1,296	1,886	1,548 $\frac{1}{4}$	2,087 $\frac{1}{4}$	2,432	2,184 $\frac{1}{4}$	2,642 $\frac{1}{4}$	2,996 $\frac{1}{4}$	3,064 $\frac{1}{4}$
London Brighton & South Coast Railway	..	86	219	239	247	325	396 $\frac{1}{4}$	454	611 $\frac{1}{4}$	683 $\frac{1}{4}$	688
London District.....	..	..	..	..	..	..	401	430	454	470	470
United Kingdom.....	..	..	..	..	..	1,968	2,741	5,099	8,096	9,506	9,506
Total.....	43,720	44,941	46,701	48,990	49,736 $\frac{1}{4}$	61,556 $\frac{1}{4}$	65,004 $\frac{1}{4}$	57,879 $\frac{1}{4}$	65,726 $\frac{1}{4}$	72,374 $\frac{1}{4}$	77,440 $\frac{1}{4}$

TABLE XXIV.—*continued.*
Number of Stations open to the Public.

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TELEGRAPH COMPANIES.		1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.
Electric and International.....		404	423	460	517	428	476	772	909	1,022	1,022	1,180
British and Irish Magnetic		201	209	230	327	382	386	401	449	464	479	491
South Eastern Railway		73	81	80	84	87	88	89	92	94	102	104
London Brighton & South Coast Railway .....		..	10	19	25	29	30	36	60	46	48	57
London District .....		..	..	..	..	..	..	62	78	84	81	83
United Kingdom.....		..	..	..	..	..	..	16	22	48	100	125
Total.....		678	723	789	953	926	1,032	1,391	1,616	1,755	1,831	2,040
Number of Instruments.												
TELEGRAPH COMPANIES.		1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.
Electric and International.....		2,458	2,774	2,988	3,024	3,194	3,352	3,629	4,003	4,489	5,136	5,778
British and Irish Magnetic		492	510	574	554	922	1,073	1,084	932	1,042	..	..
South Eastern Railway		130	145	141	133	129	133	135	145	142	168	169
London Brighton & South Coast Railway .....		..	10	65	74	92	114	131	156	159	..	..
London District .....		..	..	..	..	..	..	72	188	198	192	195
United Kingdom.....		..	..	..	..	..	..	66	88	172	285	358
Total.....		3,080	3,439	3,768	4,085	4,338	4,744	5,132	5,522	6,196	..	..
Number of Public Messages.												
TELEGRAPH COMPANIES.		1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.
Electric and International.....		717,104	768,248	844,668	870,143	1,025,269	1,117,364	1,201,515	1,534,590	1,778,789	1,945,465	2,198,046
British and Irish Magnetic		264,727	316,420	356,186	406,608	549,880	608,332	689,738	671,650	827,424	1,030,142	1,251,265
South Eastern Railway		36,698	36,855	40,309	31,394	45,466	48,897	55,085	62,895	62,968	69,923	88,711
London Brighton & South Coast Railway .....		..	..	1,199	5,350	6,941	11,425	14,664	21,680	30,024	43,208	62,942
London District .....		..	..	..	..	..	..	74,582	144,022	243,849	247,606	316,272
United Kingdom.....		..	..	..	..	..	..	11,659	133,514	226,729	618,651	743,870
Total.....		1,017,529	1,122,722	1,247,013	1,321,086	1,629,730	1,863,839	2,123,589	2,676,382	3,186,724	3,924,855	4,662,687

* Partly estimated.

TABLE XXV.
B E L G I U M.
 Division of Entire Traffic, shewing the Percentage of Government, Stock Exchange,
 Commercial, Press or Private Messages.

DESCRIPTION.	INTERIOR AND INTERNATIONAL TRAFFIC UNDIVIDED.											
	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.
Government Messages	4	3	1.50	2	2.5	2	3	2.5	1.9	1	2	1
Stock-Exchange	60	54	40.5	37	26	35	36	37	26	20	11	9
Commercial	19	26	42	39	42	40	39	38	61	55	56	43
Press	7	4	4	6.5	8	8	16	6	4.8	4	2	2
Private	10	13	12	16.5	21.5	15	6	16.5	16.3	20	29	45

DESCRIPTION.	INTERIOR (A.) AND INTERNATIONAL (B.) TRAFFIC DIVIDED.											
	A.	B.	A.	B.	A.	B.						
1863.	1864.	1865.	1866.	1867.	1868.	1869.						
Government Messages	1	3	1	1.5	1	1.5	0.9	1.5	0.43	0.77	0.42	0.7
Stock-Exchange	12	22	12	18.5	10	17.5	9.61	15.13	6.27	12.98	4.42	12.14
Commercial	45	62	45	59.5	40.5	54	27.25	48.38	31.76	47.45	34.89	56.43
Press	1	3	1	1.5	1.5	2	1.66	3.11	2.69	3.2	1.24	3.07
Private	41	10	41	19	47	25	60.58	31.88	58.86	35.60	59.03	27.66

TABLE XXV—*continued.*

DESCRIPTION.	NATURE, DIVISION, AND PER-CENTAGE OF SERVICE MESSAGES.						1859.
	1851.	1852.	1853.	1854.	1855.	1856.	
Train Signals.....	52	52	64	63	61	49	56
Packages Lost or Missing	12	13	13	14	10	13	8
Railway Service	18	14	8	6	15	24	15
Telegraph Service.....	18	21	16	17	14	16	17

TABLE XXVI.
COLONIAL STATISTICS.

COLONY.	DATE.	NUMBER OF TELEGRAPH STATIONS.	MILES OF TELEGRAPH LINE.	MILES OF TELEGRAPH WIRE.	NUMBER OF TELEGRAMS.	NUMBER OF WORDS.	TOTAL CAPITAL EXPENDED.	GROSS RECEIPTS.
Victoria	1867	87	2613½	3171	235,648	3,980,000	262,835 £ 5 2	39,799 3* 2
South Australia.....	1866	64	1113½	1164½	122,138	—	136,012 10 9	12,688 17 9
New South Wales.....	"	71	3637	4064	130,447	—	132,025 18 3	30,005 4 7
Queensland	"	33	1584	1752	56,143	—	99,178 19 5	14,444 6 2
New Zealand	"	20	—	—	70,952	—	—	12,840 14 9

NOTE.—The above includes charges for Government Messages, &c.

GENERAL REMARKS,

RELATING TO

THE WORKING OF THE VARIOUS GOVERNMENT LINES.

AUSTRIA AND HUNGARY.

In Receipts are included sums paid by private Companies (Railways, &c.) for the privilege of working their lines.

Neither the receipts nor the expenses can be *accurately* given, the old system of accounts not being adapted for statistical information.

Up to 1868 Government messages were sent free; from January 1st, 1869, the only messages sent gratis were those of the Royal family, these amounted to in 1869:

Austria ... 168,120

Hungary ... 41,845

Total Messages ... 209,965

Under the head of "Services" are included regular Services, the Stock Exchange Circulars, the Meteorological reports, and the messages referring to the Lottery drawings.

BADEN.

Government messages which are sent free, average from 200 to 300 per annum, these are counted with the rest.

BAVARIA.

No account has been kept of "Services."

BELGIUM.

The figures for 1869 are taken at an average, the accounts not being completed when the statistical report was published. Up to 1863 Internal and International messages were not separated. Under the head of "Services" figure messages referring to Railways amount to about 85 per cent. of total number. *Government messages are charged for like the rest.*

DENMARK

In 1866 was at war. Receipts decreased some 49 per cent. "Services" only separated from the rest of messages, since 1860, and from 1866 they include Meteorological messages.

GERMANY (NORTH).

Up to the end of 1858 no distinction was made between Internal and International messages; up to the end of 1853 "Services" not distinguished from ordinary messages; from 1854 "Services" simply include Internal ones; International Services are included in International Messages; from 1866 number of "Services" is calculated by taking an average of three days a month.

HOLLAND.

The figures for 1869 are taken at an average. "Services" include Meteorological messages.

ITALY.

Previous to 1862, no data; in 1867 the lines, &c. of the Venetian provinces, and in 1870 those of the Roman provinces became the property of the State, thus it is impossible to obtain any reliable data.

Government messages pass gratis.

In 1869 the Semaphore system was attached to the telegraphs,	... ...	... ...	... ...	Frs. 92,532
and cost in 1868	... ...	... ...	... ...
And in 1869	... ...	... ...	... ...	92,116
<u>Total Frs. 184,648</u>				

which should be added to the cost of establishment.

RUSSIA.

Messages sent gratis are those of the Imperial family, and from 1866 the Meteorological messages.

No record appears of working expenses for 1856, although "Cost of Establishment" and "Receipts" begin that year.

SPAIN.

For six years, 1859-64, no expenses appear for "establishment" although both lines and wires had regular additions made.

The following table will shew the cost per telegram for the years 1858, 1861, 1864, and 1867:—

Date.	Total Receipts.	Total Working Expenses.	Total Loss.	Total Number of Messages (including Services).	Apparent Cost per Message.
1858	Francs. 821,259	Francs. 2,688,596	Francs. 1,867,337	162,994	Francs. 11.45
1861	1,551,695	3,020,280	1,468,585	348,022	4.22
1864	1,529,112	4,446,142	2,917,030	819,952	3.55
1867	1,337,427	3,238,655	1,901,228	793,829	2.39

SWEDEN.

Under the head of "receipts various" appear large sums amounting to 39 per cent. of the total "receipts," and the "*Statistique Générale*" has the following note—"The 'receipts various' comprise the subventions accorded by the Government for the construction of new lines."

About 99 per cent. of "Services" since 1862 refer to railways, Telegraph "Services" figure for only 1 per cent. of total. Meteorological messages go free.

SWITZERLAND

Pays 4 per cent. annually on Frs. 500,000 (£20,000), lent to the Telegraphic Administration in 1867 by the Government; this yearly payment appears under the head of "Working Expenses."

Government messages are charged for the same as ordinary messages.

SYNOPSIS OF SUBMARINE TELEGRAPH COMPANIES,

Companies.	Capital.
ANGLO-AMERICAN TELEGRAPH COMPANY, LIMITED	Consolidated Stock £1,675,000
*ANGLO-MEDITERRANEAN TELEGRAPH COMPANY, LIMITED	Consolidated Stock £430,000
BRITISH AUSTRALIAN TELEGRAPH COMPANY, LIMITED	66,000 shares of £10 each £660,000 Less unissued 984 " " 9,840 65,016 £650,160
BRITISH-INDIAN EXTENSION TELEGRAPH COMPANY, LIMITED	46,000 shares of £10 each £460,000 Mortgage Debentures at 6 per cent. 8,500 £468,500
*BRITISH-INDIAN SUBMARINE TELEGRAPH COMPANY, LIMITED	120,000 shares of £10 each £1,200,000 Less unissued 1,250 " " 12,500 118,750 £1,187,500
CHINA SUBMARINE TELEGRAPH COMPANY, LIMITED	52,500 shares of £10 each £525,000 6 per cent. Debenture Bonds 9,600 £534,600
CUBA SUBMARINE TELEGRAPH COMPANY, LIMITED	16,000 shares of £10 each £160,000 With power to raise £50,000 by bonds
*FALMOUTH, GIBRALTAR, and MALTA TELEGRAPH COMPANY, LIMITED	76,000 shares of £10 each £760,000

* These Companies are to be amalgamated under the

HAVING CABLES NOW AT WORK, 1872.

Dividends and Reserved Fund.	Length of Cables.	Date of laying Cable.
10 per cent. per annum, 1871 Reserve Funds, £76,502	Two Cables between— Valentia and Heart's Content Bay 1,898 1,852 Total 3,750	1865 & 1866 1866.
15 per cent. per annum, 1871.. Reserve Fund, £7,804	Two Cables between— Malta and Alexandria 924 976 Total 1,900	1868. 1870.
5 per cent. per annum interest, 1871.	Two Cables between— Singapore and Batavia (Java) 557 Banjoewangie (Java) to Port Darwin (in northern territory of South Australia) .. 1,082 Total 1,639	1870. 1871.
8 per cent. per annum, 1871 .. Reserve Fund, £4,218	Two Cables— Madras to Penang 1,409 Penang to Singapore 400 Total 1,809	1870
7½ per cent. per annum, 1871 Reserve Funds, £20,877	Two Submarine Cables— Suez to Aden 1,463 Aden to Bombay 1,820 Total 3,283 Also, Two Land Lines between Alexandria and Suez, one going via Cairo (224 miles), the other via Benha and Zagazig (230 miles) .. 454	1870 1871
6 per cent. per annum, 1871 ..	Two Submarine Cables— Singapore to Saigon (Cochin China) 620 Saigon to Hong-Kong 976 Total 1,596	1871
Nil per cent. per annum, 1871 Reserve Fund, £1,600	One Cable between— Santiago and Batabano 520 Also, a Land Line from Batabano to Havana.. 30	1870
7½ per cent. per annum, 1871 Reserve Fund, £9,866	Four Cables between— Porthcurno (near Penzance) to Lisbon 824 Lisbon to Gibraltar 331 Villa Real (Guadiana River to Gibraltar) 155 Gibraltar to Malta 1,120 Total 2,430	1870 " 1871 1870

title of "The Eastern Telegraph Company, Limited.

SYNOPSIS OF SUBMARINE TELEGRAPH COMPANIES,

Companies.	Capital.
GREAT NORTHERN TELEGRAPH COMPANY OF COPENHAGEN (Incorporated under Danish Law, with Limited Liability)	40,000 shares of £10 each £400,000
GREAT NORTHERN TELEGRAPH, CHINA and JAPAN EXTENSION COMPANY (Incorporated under Danish Law, with Limited Liability)	60,000 shares of £10 each £600,000
GOVERNMENT INDO-EUROPEAN TELEGRAPH..	.. .. .. .. .. .. .. ..
INDO-EUROPEAN TELEGRAPH COMPANY, LIMITED	18,000 shares of £25 each £450,000 Less unissued 1,000 of £25 each 25,000 £425,000
*MARSEILLES, ALGIERS, and MALTA TELEGRAPH COMPANY, LIMITED	20,000 shares of £10 each £200,000
MEDITERRANEAN EXTENSION TELEGRAPH COMPANY, LIMITED	3,200 8 per cent. preference shares of £10 each £32,000 12,000 ordinary shares of £10 each 120,000 £152,000

* These Companies are to be amalgamated under the

HAVING CABLES NOW AT WORK, 1872.—*continued.*

Dividends and Reserved Fund.	Length of Cables.	Date of laying Cable.
8 <i>7</i> per cent. per annum, 1871 Reserve Fund, £9,618	<p>Six Submarine Cables—</p> <p>Newbiggin (Northumberland) to Söndervig (Denmark) 334</p> <p>Hirtshals (Denmark) to Arendal (Norway) 66</p> <p>Möen (Denmark) to Bornholm, an island in the Baltic Sea, Bornholm to Libau (Russia) 304</p> <p>Peterhead (Aberdeenshire) to Egersund (Norway) 270</p> <p>Grislehamn (Sweden) to Nystad (Russia) 96</p> <p>Total <u>1,070</u></p>	
2 <i>s.</i> 3 <i>d.</i> per share, 1871 (Accounts not published) ..	<p>Three Submarine Cables—</p> <p>Wladivostock (Possiette Bay) to Nagasaki (Japan) 760</p> <p>Nagasaki to Shanghai 482</p> <p>Shanghai to Hong-Kong 897</p> <p>Total <u>2,139</u></p>	1871
	<p>Five Submarine Cables—</p> <p>Fão to Bushire 157</p> <p>Bushire to Jask, Two Cables { 505 }</p> <p>Jask to Gwadur { 500 }</p> <p>Gwadur to Kurrachee 291</p> <p>Total <u>1,721</u></p>	1864 1869 1864 1864 1864
Nil per cent. per annum, 1871	<p>Land Lines starting from Emden, near Hanover, to Teheran, the Capital of Persia 5,360</p>	1870
4 per cent. per annum, 1871 .. Reserve Fund, £1,847	<p>Two Submarine Cables—</p> <p>Marseilles to Bona (Algeria) 447</p> <p>Bona to Malta 378</p> <p>Total <u>825</u></p>	1870.
3 per cent. per annum, 1871 .. Reserve Fund, £3,510	<p>Three Submarine Cables—</p> <p>Alga Grande (Sicily) to Malta 62</p> <p>Pozzallo (Sicily) to Malta 62</p> <p>Otranto to Corfu 65</p> <p>Total <u>189</u></p> <p>Land Lines (Corfu to Sidari) 25</p> <p>do. (Alga Grande to Modica 5) 12</p> <p>do. (Pozzallo to Modica 7) 12</p> <p>Total <u>37</u></p>	1859. 1869. 1860.

title of "The Eastern Telegraph Company, Limited."

SYNOPSIS OF SUBMARINE TELEGRAPH COMPANIES,

Companies.	Capital.
PANAMA and SOUTH PACIFIC TELEGRAPH COMPANY, LIMITED	32,000 shares of £10 each £320,000 With power to raise £50,000 by bonds.
SOCIÉTÉ DU CABLE TRANSATLANTIQUE FRANÇAIS, LIMITED	62,500 ordinary shares of £20 each....£1,250,000
SUBMARINE TELEGRAPH COMPANY between Great Britain and the Continent of Europe (incorporated by Royal Charter)	Consolidated Stock Chartered Company £338,225 Scrip Certificates French Company .. 75,000 Debenture Bonds £413,225 5,415 £418,640
WEST INDIA and PANAMA TELEGRAPH COMPANY, LIMITED	Shares of £10 each, 65,000 £650,000 Less shares reserved, 7,809 78,090 57,191 £571,910 Debentures 27,000 £598,910 Total of Capital employed .. £10,280,370 (Exclusive of Government Indo-European Line)

HAVING CABLES NOW AT WORK, 1872.—*continued.*

Dividends and Reserved Fund.	Length of Cables.	Date of laying Cable.
Not yet in operation	Proposed Cable, from Panama to Tumbez, touching at Ecuador and New Granada .. 1,100	
12 per cent. per annum, 1871 Reserve Funds, £41,759	Three Cables— Brest to St. Pierre, Newfoundland 2,584 St. Pierre to Duxbury, near Boston 749 Total 3,333 1869. One Cable between— Salcombe, Devonshire, and a point north of Brest (Brignogan) 100 1870. Total 3,433	
15 per cent. per annum, 1871 Reserve Fund, £44,023	Seven Cables as follows:— Dover to Calais 24 1851 Dover to La Panne (Belgium) 47 1867 Ramsgate to Ostend 70 1863 Folkestone to Boulogne 25 1859 Beachy Head to Dieppe 78 1861 Beachy Head to Havre 69 1870 Jersey to France (Pirou) 30 1860 Total 343	
Nil per cent. per annum, 1871	The Company also work three Cables on behalf of the Post Office, two between England and Holland, and the third between England and Norderney (Prussia).	
	Fifteen Cables as follows:— Santiago (Cuba) to Jamaica 140 Jamaica to Aspinwall 605 1870 Jamaica to Portorico 582 Portorico to St. Thomas 110 St. Thomas to St. Kitts 133 St. Kitts to Antigua 90 Antigua to Guadaloupe 84 Guadaloupe to Dominica 55 Dominica to Martinique 60 Martinique to St. Lucie 66 1871 St. Lucie to St. Vincent 64 St. Vincent to Barbadoes 150 St. Vincent to Grenada 80 Grenada to Trinidad 120 Trinidad to (Georgetown) Demerara 350 Total 2,688	
	Land lines, across Jamaica 50 From Basse-Terre (the landing point) } 52 Guadalupe to Point-ar-Petre } 52 Across Trinidad 83 From Georgetown to Berbice, the terminus 90 Total 275	
	Total Length of Cables miles 37,795	



